APPENDIX C

INQUIRY LETTERS AND FACILITY RESPONSES

5772

APPENDIX B

FERMCO PCB POLICY

APPENDIX A

LIST OF PERMITTED PCB DISPOSAL FACILITIES:

TSCA HOTLINE AND EPA REGION 5

US EPA 1990c, Engineering Bulletin Chemical Dehalogenation Treatment: APAG Treatment, EPA/540/2-90/015, September, 1990, Office of Emergency and Remedial Response, Washington, DC.

US EPA 1990d, Engineering Bulletin Solvent Extraction Treatment, September, 1990, EPA/540/2-90/013, Office of Emergency and Remedial Response, Washington, DC.

US EPA 1990e, Technology Demonstration Summary SITE Program Demonstration Test, Solidtech, Inc. Morganville, New Jersey, May 1990, EPA/540/S5-89/005, United States Environmental Protection Agency.

US EPA 1991a, The Superfund Innovative Technology Evaluation Program: Technology Profiles Fourth Edition, EPA/540/5-91/008, November, 1991, Office of Solid Waste and Emergency Response, Washington, DC.

US EPA 1991b, Synopses of Federal Demonstrations of Innovative Site Remediation Technologies, EPA/540/8-91/009, Member Agencies of the Federal Remediation Technologies Roundtable, Washington, DC.

US EPA 1991c, Technology Demonstration Summary: Design and Development of a Pilot-Scale Debris Decontamination System, EPA/540/55-91/006, September 1991, SITE.

US EPA 1992, Innovative Treatment Technologies: Semi-Annual Status Report (Fourth Edition), EPA 542-R-92-011, October 1992, Solid Waste and Emergency Response, Washington, D.C.

WOMA Corporation, 3332 Cedar Street, Everette, Washington: (206) 258-1356, (800) 258-5530.

ThermoCor, Inc., Personal Communication from John H. Lanier, Vice President of Engineering, ThermoCor, Inc., Niagara Falls, New York.

Union Carbide Chemicals and Plastics Company, Material Safety Data Sheet for Triton X-100, Union Carbide Chemicals and Plastics Company, Chicago, Illinois.

US EPA 1985b, Project Summary Destruction of PCBs - Environmental Applications of Alkali Metal Polyethylene Glycolate Complexes, EPA/600/S2-85/108, December, 1985, Hazardous Waste Engineering Laboratory, Cincinnati, Ohio.

US EPA (U.S. Environmental Protection Agency) 1985a, Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, EPA/600/2-85/028, March 1985, U.S. EPA, Hazardous Engineering Research Laboratory, Cincinnati, Ohio.

US EPA 1987, A Compendium of Technologies Used in the Treatment of Hazardous Wastes, EPA/625/8-87/014, September, 1987, Center for Environmental Research Information, Cincinnati, Ohio.

US EPA 1988, The Superfund Innovative Technology Evaluation Program: Technology Profiles, November, 1988, EPA/540/5-88/003, Office of Solid Waste and Emergency Response, Washington, DC.

US EPA 1989a, Corrective Action: Technologies and Applications, EPA/625/4-89/020, September, 1990, Center for Environmental Research Information, Cincinnati, Ohio.

US EPA 1989b, Stabilization/Solidification of CERCLA and RCRA Wastes, EPA/625/6-89/022, May 1989, Center for Environmental Research Information, Cincinnati, Ohio.

US EPA 1990a, Guidance on Remedial Actions for Superfund Sites with PCB Contamination, EPA/540/G-90/007, August 1990, Office of Emergency and Remedial Response, Washington, D.C.

US EPA 1990b, Physical/Chemical Treatment of Hazardous Wastes, CERI-90-16, April 1990, U.S. EPA, Center for Environmental Research Information, Cincinnati, Ohio.

Journal of Air and Waste Management 1992, Development and Decontamination of a Pilot-Scale Debris Washing System (IT Environmental Programs, Inc.), JAWM, April 1991, Vol. 41, No. 4.

McCoy and Associates, Inc., 1989, Biodegradation by White Rot Fungus, The Hazardous Waste Consultant, November/December 1989, Volume 7, Issue 6, p. 4-24.

McCoy and Associates, Inc., 1990, Ultrasonic Detoxification of PCB-Contaminated Soil, The Hazardous Waste Consultant, November/December 1990, Volume 8, Issue 6, p. 1-1.

McCoy and Associates, Inc., 1992, Special Feature: Polychlorinated Biphenyls (PCBs) - Regulations and Treatment Technologies, The Hazardous Waste Consultant, May/June 1992, Volume 10, Issue 3, page 4.1.

MODAR, Inc, 1988, The Modar Oxidation Process, Technical Brochure, Modar, Inc., Natick, MA.

Mutch, R.D., 1988, Remediation of Contaminated Structures - Part II: Remedial Technologies, Proceedings of the First Annual Hazardous Materials Management Conference/Central, published by Tower Conference Management Company, Glen Ellyn, Illinois, 1988.

Pentek Inc., 1992 Personal Communication with Nancy Moore and Technical Literature on Pentek Strippable Coatings, Pentek Inc., Corapolis, Pennsylvania.

Pirbazair, Massoud, Badri N. Badriyha, Sung-Hyun Kim, and Richard J. Miltner, February, 1992, Evaluating GAC Adsorbers for the Removal of PCBs and Toxaphene, Journal of the American Water Works Association, p. 83.

Reason, J. editor, 1989, PCB-Flooded Surfaces Need Special Treatment, Electrical World, September 1989, volume 203, number 9, page S-43.

Staszak, Carl N. , Kenneth C. Malinowski, and William R. Killelea, The Pilot-Scale Demonstration of the MODAR Oxidation Process for the Destruction of Hazardous Organic Waste Materials, Environmental Progress, Vol. 6, No. 1, February 1987, p. 39.

Canonie Environmental Services Corporation, Technical Information on the SoilTech ATP thermal treatment system.

Chemical Waste Management, Marketing Information.

Colburn K.A., 1991, PCB Decontamination of Operating Facilities, Paper Presented at the EPRI 1991 PCB Seminar.

Detox Industries, Inc., Personal Communication with Philip H. Balis and Technical Literature on Detox Industries Biological Degradation Technology, Detox Industries, Inc., Houston, Texas.

Ecology and Environment, Inc., Personal Communications with Gary Robinson and Scott McCone, Ecology and Environment, Inc., Lancaster, New York.

Espisito, M.P. et al, and R. Clark et al, 1987, Decontamination Techniques for Buildings, Structures and Equipment, Noyes Data Corporation, Park Ridge, New Jersey, U.S.A., 1987.

Florida Chemical Company, Inc. 475 Dakota Avenue N., P.O. Box 997, Lake Alfred, Florida: (813) 956-1843.

Galson Remediation Corporation, Technical Brochure on APEG-PLUS treatment system, Galson Remediation Corporation, East Syracuse, NY.

HAZMAT WORLD, 1992, Letter to the editor by Scott McCone of Ecology and Environment, Inc., Lancaster, New York.

Integrated Chemistries, Incorporated, Personal Communication with Cathy Iverson, and Technical Literature on CAPSUR(R), Integrated Chemistries, Incorporated, St. Paul, Minnesota.

Isley, D.A., 1989, Cleanup of a PCB Spill in a Water Treatment Plant, Nuclear Plant Journal, November-December 1989, pp. 75 through 77.

IT Corporation, Inc., Personal Communication with Michael L. Taylor, IT Corporation, Inc., Cincinnati, Ohio.

7.0 REFERENCES

Ackerman, D.G., et al, 1983, Destruction and Disposal of PCBs by Thermal and Non-Thermal Methods, Noyes Data Corporation, Park Ridge, New Jersey, U.S.A., 1983.

American Nuclear Society 1991, Integrated Five Station Non-Destructive Assay System Used to Support Plutonium Facility Decommissioning (EkoTek, Inc.), Invited Paper, ANS Winter Meeting, San Francisco, California, 1991.

Barkley, N.P., 1990, Update on Building and Structure Decontamination, Journal of the Air and Waste Management Association, August 1990, volume 40, number 8, page 1174.

Bartlett Services, Inc., Personal Communication with Robert J. Scott and Technical Literature on Stripcoat TLC and BY PAS 1055, Bartlett Services, Inc., Plymouth, Massachusetts.

Biochem Systems, P.O. Box 4040, Golden, Colorado: (303) 239-7758, (800) 777-7870.

Bohnen, B.A., 1991, Cleanup of Polychlorinated Biphenyls Using the CAPSUR(R) Technology, HAZTECH International '91 Conference Proceedings, (Houston, Texas), published by the Northwest Center for Professional Education, Bellevue, Washington, 1991.

Bohnen, B.A., 1992, Guidelines for Successful PCB Cleanup, Article sent by Millipore Corporation, Marlboro, Massachusetts.

Boyd, J.W., W.R. Schoefild, and D.E. Schramm, 1986, Mobile Electric Reactor Detoxifies PCBs, Hazardous Materials and Waste Management Magazine, March-April 1986, p. 32.

Carpenter, Ben H. 1986, PCB Sediment Decontamination-Technical/Economic Assessment of Selected Alternative Treatments, September, 1986, Hazardous Waste Engineering Research Laboratory Office of Research and Development, Cincinnati, Ohio.

Based on the forgoing, the management of PCBs and PCB items at the FEMP Site should:

1. Continue the on-site storage of radioactively-contaminated PCB liquids and solids at FEMP while actively pursuing disposal at the DOE TSCA Oak Ridge Incinerator. Also continue with the on-site storage of radiologically contaminated PCB solids until the TSCA Incinerator is capable of destroying radioactively contaminated PCB solids.

2. Pursue the implementation of appropriate disposal technologies for the decontamination of most aqueous PCB and radioactively-contaminated aqueous PCB streams, and the removal of PCBs and radioactive materials from contaminated surfaces.

3. Future PCB-contaminated wastes and radioactively-contaminated PCBs from the FEMP site need to be more fully characterized and well documented in order to a) determine the applicability of certain on-site decontamination and disposal options, and b) minimize the potential spread of PCB contamination as a result of OU3 removal and destruction activities. Although on-site disposal via a contractor-provided disposal system may be technically feasible for the PCBs stored or potentially generated at the FEMP site, more detailed waste characteristics are necessary to determine which PCB disposal technologies may be applicable to the waste. At a minimum, the following necessary waste characteristic information will need to be obtained:

   - Type of contaminated media and complete description of waste form;

   - PCB concentrations and types;

   - Additional waste contaminants (e.g., detergents, heavy metals, and organics); and,

   - Radionuclide concentrations, types, and form.

   Treatability studies and safety and risk assessments will also be required to definitively determine the applicability of appropriate PCB disposal technologies.

6.0 SUMMARY

The investigation of disposal options for PCBs currently in storage at the FEMP, or that may be generated during future remedial actions, identified the following issues:

- The multiple-contaminant nature of much of the stored and potentially generated PCBs and PCB items at the FEMP site (PCBs, radionuclides, and RCRA constituents) greatly complicates disposal and treatment options.

- The DOE TSCA Oak Ridge Incinerator is only capable of accepting and treating radioactively-contaminated, liquid PCB waste. Although disposal of PCB-contaminated solids is planned at the DOE TSCA Oak Ridge Incinerator, no definitive schedule for solid waste destruction is available and it appears to be at least 5 years in the future.

- Existing commercial PCB disposal facilities cannot accept PCBs contaminated with radionuclides at levels above background.

- Low level radioactive waste storage/disposal sites cannot accept material contaminated with PCBs at or above the regulatory limit.

- Off-site disposal of radioactively contaminated PCBs to any commercial PCB disposal facility other than the DOE TSCA Oak Ridge Incinerator, is unknown because there simply are no other facilities with the ability to disposition radioactively contaminated PCBs and PCB items. Shipments of non-radioactively contaminated PCBs and PCB items generated in a radiologically contaminated area will occur if the facility can adequately demonstrate to DOE Headquarters that the PCBs and PCB items are not radioactively contaminated.

- On-site destruction of PCBs, and radioactively contaminated PCBs, is technically feasible. A number of disposal technologies may be applicable for the decontamination of PCB surfaces, PCB-contaminated solids and PCB-contaminated aqueous streams.

- Used personal protective equipment (Tyveks, booties, respiratory filters, etc.)

- Brushes, rags, paint rollers, brooms, etc. used during decontamination activities loaded with decontamination chemicals and contaminants (i.e., PCBs, oil, grease, rust, dirt, and perhaps radionuclides)

- Adsorbents such as herculite and dicalite

- Sludge generated from the removal of oil, grease, dirt, rust, radionuclides

- Soils

- Equipment and hardware not able to be decontaminated.

The solid waste streams may be contaminated with PCBs, oils and greases, decontamination chemicals, dirt, rust, and radionuclides.

5.2.1 Potential Liquid Waste Characteristics

The liquid PCB wastes that may be generated during removal, decontamination, and disposal activities for PCB Items may include the following:

- Drained PCB-contaminated hydraulic fluids or heating fluids potentially contaminated with radionuclides

- Spent decontamination chemicals from the decontamination of PCB-contaminated equipment, metal surfaces, concrete, etc. These spent decontamination chemicals may also contain PCBs, oil, grease, rust, dirt, paint, and radionuclides

- Rinsewaters.

The liquid waste streams may be organic, a combination of aqueous and organic constituents, or aqueous. The anticipated organic waste streams, such as that generated from the draining of PCB-contaminated hydraulic fluids or heating fluids, could also contain dirt, rust, oil, and grease. For waste streams that contain both aqueous and organic constituents, such as wastewaters generated during the decontamination of PCB-contaminated equipment, the organic constituents may be present as a separate phase or may be emulsified. Emulsification of the organic constituents may occur during high-pressure washing and the degree of emulsification is often influenced by both the particular decontamination chemical(s) used and the temperature of the water/decontamination chemical solution[18]. Aqueous waste steams, such as those generated from decontamination rinsewaters, will contain mainly water but may also contain trace amounts of PCBs, rust, dirt, and decontamination chemicals.

5.2.2 Potential Solid Waste Characteristics

The solid PCB wastes which may be generated during removal, decontamination, and disposal activities for PCB Items may include the following:

---

[18]As noted in Table 4-2 (Section 4.3), particular decontamination chemicals are water soluble (such as Triton-X) and other decontamination chemicals are non-water soluble (such as d-limonene).

contacted was able to discuss its' radionuclide acceptance criteria as thoroughly as Rollins.

Appendix C contains an example of the waste disposal inquiry letter[17] sent to the companies listed above, and also contains the written responses from the companies contacted. In general, all companies interested in handling/treating/disposing of the PCB wastes require more information about the characteristics of the waste such as level of radioactive contamination, concentration of PCBs in the material, and concentrations of other contaminants.

5.2 POTENTIAL PCBs AND PCB ITEMS

The PCB materials remaining within the OU3 boundaries contained in transformers, capacitors, hydraulic fluids, heating fluids, and other equipment are unknown. A site survey of potential PCBs and PCB items is currently underway because it is essential that these items be identified for removal, decontamination, and disposal prior to demolition of buildings and structures within OU3. This will reduce the risk of generating larger quantities of PCB contaminated wastes during remediation activities.

It is anticipated that the following PCBs or PCB Items may be identified during the PCB site survey:

- PCB capacitors
- Leaking fluorescent light ballasts
- PCB-contaminated hydraulic fluids
- PCB-contaminated heating fluids
- PCB-contaminated equipment
- PCB-contaminated debris (concrete, soil, etc.)
- Recharacterized waste streams.

The activities of removing, decontaminating as appropriate, and disposing of PCBs and PCB Items prior to demolition of the structures and buildings within OU3 will generate liquid and solid wastestreams. The general characteristics of the anticipated solid and liquid wastestreams are discussed in the following sections.

---

[17] The waste treatment/disposal inquiry letter was written prior to receiving the Material Control and Accountability (MC&A) PCB inventory printout. A follow-up table was later sent containing the information listed in the MC&A printout.

facility responses are as follows:

- Aptus, Inc., Coffeyville, Kansas (incinerator, chemical treatment, and physical separation) - However, the operating permit for this facility specifically prohibits the receipt or disposal of radioactive materials.

- Chemical Waste Management (incinerator, chemical treatment, chemical waste landfill) - Chemical Waste Management feels they have the capability to handle and dispose of the various PCB wastes (liquids and solids), however acceptance of the material is contingent upon the level of radioactive contamination present in the material. In general, their PCB disposal facilities do not have radioactive materials licenses and, therefore, could not accept licensed or DOE radioactive material above background.

- Detox Industries, Inc., Houston, Texas (biological treatment) - An affiliated company associated with Detox Industries, Inc. is licensed to work with radioactive material, and therefore Detox Industries, Inc., in conjunction with its' affiliated company, is interested in remediating the liquid wastes stored at FEMP. Detox does not operate fixed PCB disposal facilities and only services clients with on-site disposal systems. A tailored treatability test would be required to identify an appropriate disposal method for the PCB wastes.

- Quadrex HPS, Inc., Gainesville, Florida (physical separation) - Quadrex does not operate an off-site PCB disposal facility capable of handling radioactive material. They have previously worked on the separation of radionuclides from liquid PCBs. Quadrex is willing to consider evaluating the radioactively contaminated PCB waste at FEMP for on-site separation or treatment. The applicability of their disposal technologies is contingent upon the type and level of radioactivity, the presence of detergents in the PCB wastes, and the exact contents of the drums.

- Rollins, Bensenville, Illinois (incinerator) - Although no written response was received from the Rollins - Illinois Site, a subsequent conversation with Scott Hofferd (a Rollins Radiation Technical Representative) indicate that Rollins has a formal radionuclide acceptance criteria (refer to Appendix C for the record of the telephone conversation). No other commercial facility

Table 5-1. FEMP Inventory of PCBs and PCB Items.[1/]

Waste Type/Description	Quantity (drums)	Additional Waste Descriptors: RCRA Classification(s)	Additional Waste Descriptors: Radioactive Classification
PCB Items in Storage at Oak Ridge			
PCB Capacitors	24	NA	Radioactively Contaminated
PCB Empty Containers in Storage	371	NA	Radioactively Contaminated
	394		

1/ The information listed in this table is compiled from a February 12, 1993 Material Control & Accountability (MC&A) PCB inventory printout, and from information contained in the January, 1994 PCB Semi-Annual Report.

000076

Table 5-1. FEMP Inventory of PCBs and PCB Items.[1/]

Waste Type/Description	Quantity (drums)	Additional Waste Descriptors: RCRA Classification(s)	Additional Waste Descriptors: Radioactive Classification
PCB Liquid Waste			
Liquid and solid waste samples	1	F002, D004, D005, D006, D007, D008, D010, D018	Radioactively Contaminated
PCB Sample Residues	1		Radioactively Contaminated
PCB Contaminated burnables	17	F001, D029, D039, D040	Radioactively Contaminated
PCB/Spent 1,1,1-trichloroethane	5	F001, D001	Radioactively Contaminated
PCB Contaminated Water	1	NA	Radioactively Contaminated
	25		
PCB Solids			
PCB Trash	4	NA	Radioactively Contaminated
PCB Fluorescent Light Ballasts and Capacitors	2	NA	Not Radioactively Contaminated
PCB/Spent 1,1,1-trichloroethane	1	F001, D001	Radioactively Contaminated
PCB Contaminated Burnables	8	F001, D029, D039, D040	Radioactively Contaminated
Capacitors	2	NA	Radioactively Contaminated
PCB Fluorescent Light Ballasts	6		
	23		

5.0 DISPOSAL OPTIONS FOR STORED PCBs AND POTENTIAL PCBs

Currently, 48 drums of PCBs and PCB-contaminated materials are in storage in Building 81 awaiting disposal. 46 of the 48 drums are suspected to contain radioactive material although quantitative data on the level of radioactive contamination is limited. It is anticipated that six of the drums will be removed from the TSCA inventory and placed into RCRA pending an analytical characterization. Additionally, there are 24 drums of PCB capacitors and 371 empty drums in storage at the TSCA storage facility in Oak Ridge awaiting disposition. The quantities and types of waste in storage are listed in the Table 5-1.

In addition to the presently stored PCBs and PCB Items, the FEMP anticipates that additional PCB-contaminated media will be generated during OU3 demolition activities. A procedure to properly identify, handle, store, treat, and/or dispose of these potential wastes will be developed prior to actual demolition activities, and employees will be appropriately trained in these procedures. A general summary of anticipated PCB wastes, and applicable disposal options based on information provided in the preceding sections, is presented in this section.

5.1 CURRENTLY STORED PCBS AND DISPOSAL OPTIONS

The PCBs and PCB items currently stored at the FEMP site are managed in accordance with the storage requirements of 40 CFR 761 and are not a safety hazard, nor do they present a threat of release to the environment. However, the FEMP is currently operating under a NON based on violation of the 1-year storage limitation. Compliance with the NON requires the FEMP to submit semi-annual status reports on PCB related activities and to provide for the timely storage and disposal of all PCB materials on site.

As discussed in Section 3.0, a number of PCB disposal facilities were contacted to determine if these facilities could accept any of the stored FEMP waste for disposal. While a number of facilities are permitted to treat/dispose of both TSCA and RCRA PCB wastes, with the exception of the DOE TSCA Oak Ridge incinerator and storage facility, no other offsite facility was clearly able to accept FEMP PCBs and PCB items that may also be contaminated with radioactive materials. A summary of the leading

F001.

- Stoddard solvent is not suitable for use with high-pressure washing. Further, although Stoddard solvent could be applied using a low-pressure spray technique, either hand wiping or a high-pressure wash would be required to subsequently clean the Stoddard solvent from the surfaces. Hand wiping is very labor intensive and would probably result in large quantities of solid waste (i.e., rags, adsorbent pads, etc...), and a high-pressure wash simply to remove the applied Stoddard solvent, an insoluble petroleum-based product, would result in large quantities of liquid waste.

The remaining decontamination chemicals listed by category are as follows:

- Detergents, soaps, surfactants (for example - Triton X-100 and BY PAS 1055)
- Foam (CAPSUR®)
- Solvents (for example - Bio-T®)
- Strippable coatings (for example - Pentek 603 or 604, and Stripcoat TLC).

As can be seen from Table 4-2, these decontamination chemicals have both favorable and unfavorable characteristics. For instance, Bio-T® is formulated from a naturally occurring, biodegradable solvent (d-limonene) and can be used in high-pressure washing operations. If Bio-T® is used during high-pressure washing operations and the resultant wastestream is then biologically treated, the presence of Bio-T® may actually enhance biodegradation. However, because Bio-T® forms an emulsion upon mixing with water, phase separation processes may not be appropriate disposal technologies.

Table 4-3. Decontamination Efficiencies of Select PCB Decontamination Chemicals.

Reference and Synopsis Mutch 1988	Surface/Cleaning Solution Bare Steel	Initial PCB Concentration (ug/100 cm2)	PCB Concentration after Cleaning (ug/100 cm2)	Average PCB Removal (%)
Integrated Chemistries Inc. Marketing Information	Concrete			
	CAPSUR			
	Case 1, 600 ft2[4/]	Souce = 110 ppm	ND to 5.5	--[5/]
	Case 11, 400 ft2[6/]	19 to 1000	<10 to <100	--[5/]
	Case 111, 150 ft2[6/]	7 to 107	<10 to <100	--[5/]
	Case 1V, 16 ft2[6/]	1.0 to 660	<10	--[5/]

Notes:

1/ The Stoddard solution was applied to the surface with a scrub brush until the surface was as clean as practical. At that time, clean Stoddard solution was brushed onto the surface to remove any additional contaminants remaining on the surface. The surface was sampled after the Stoddard solution had nearly evaporated.

2/ The Triton X-100 was diluted to a one percent solution and applied with brushes until the surface was as clean as practical. A clean solution was then applied to remove further contaminants. The surface was sampled after drying.

3/ The sodium hydroxide was applied as a heated, 12 percent solution with the use of a high-pressure washer. After the sodium hydroxide solution had completely evaporated, the surface was thoroughly rinsed with trichloroethylene.

4/ One application of the CAPSUR product was applied. Refer to Section 4.1.3 for an explanation of the steps involved in one application of CAPSUR.

5/ The literature does not contain the data necessary to calculate percent removals.

6/ The literature does not indicate the number of CAPSUR applications.

Table 4-3. Decontamination Efficiencies of Select PCB Decontamination Chemicals.

Reference and Synopsis Mutch 1988	Surface/Cleaning Solution Bare Steel	Initial PCB Concentration (ug/100 cm2)	PCB Concentration after Cleaning (ug/100 cm2)	Average PCB Removal (%)
This study compared the PCB removal efficiencies of Stoddard solution, Triton X-100 solution, and NaOH/TCE on brick, concrete, bare steel, and painted steel	Stoddard solution[1/]	78,000	ND, ND, ND	99.9
	Triton X-100 solution[2/]	78,000	1000, 39, ND	99.5
	Sodium hydroxide/trichloroethylene[3/]	78,000	ND, ND, ND	99.9
	Painted Steel			
	Stoddard solution[1/]	11,000	61, 30, .1	99.4
	Triton X-100 solution[2/]	11,000	57, 63, 68	99.4
	Sodium hydroxide/trichloroethylene[3/]	20,000	ND, 55, 10	99.9
	Concrete			
	Stoddard solution[1/]	2,300	1300, 1200, 1100	47.8
	Triton X-100 solution[2/]	2,300	1200, 570, 370	69.0
	Sodium hydroxide/trichloroethylene[3/]	2,300	530, 1300, 480	63.6

Table 4-2. List of Common PCB Decontamination Chemicals.[1/]

Name/Company	General Description and Appearance and Odor	pH (standard units)	Flash Point (°F)	Constituents	Percentages of Constituents	Regulatory Considerations	Health and Safety Considerations	Waste Treatment/ Disposal Considerations
Stripcoat TLC Bartlett Services, Inc.	- water-based, strippable decontamination coating - milky liquid - slight ammonia odor	unknown	No flash point	- Ammonia* - Other constituents unknown	0.8%	Refer to footnote 3	Constituents of this product have Threshold Limit values (TLVs). Refer to footnote e.	The use of strippable coatings will generate mainly solid waste and a minimal amount of liquid waste.

Notes:

1/ The information listed in this table is taken from product information and MDSs.
2/ The ingredients of this product are listed on the TSCA inventory.
3/ The constituents of this product marked with an asterisk (*) are subject to reportable quantity (RQ) reporting requirements under CERCLA.
4/ The constituents of this product marked with a plus (+) are subject to reporting requirements under SARA 313 and 40 CFR 372.
5/ The Threshold Limit Value (TLV) is defined by the American Conference of Governmental Industrial Hygienists as the time-weighted average concentration for a normal 8-hour work-day and a 40-hour work-week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
6/ The technical grade of d-limonene is 95% 1-methylcyclohexene.
7/ This d-limonene based cleaner is formulated with no hazardous constituents, and the following products are available through Biochem Systems: Bio T Max, Bio T, Bio T Foam, Bio T 200A, and Bio T 300B.

0000070

Table 4-2. List of Common PCB Decontamination Chemicals.[1/]

Name/Company	General Description and Appearance and Odor	pH (standard units)	Flash Point (°F)	Constituents	Percentages of Constituents	Regulatory Considerations	Health and Safety Considerations	Waste Treatment/ Disposal Considerations
Strippable Coatings								
Pentek-603,-604/ Pentek, Inc.	- self-stripping water-based organic polymer - PENTEK 603 used for carbon steels - PENTEK 604 used for all other metals and nonporous materials such as rubber and plastic - clear, thick viscous solution - honey-like odor	unknown	No flash point	- Polymer in water - Proprietary formulation	40% 26%	Not regulated, nonflammable, nontoxic	Has primary irritation index of 1.53 for dermal irritation (mildly irritating to rabbit skin) and is practically non-irritating to rabbit eyes. The TLV is unknown.	The use of strippable coatings will generate mainly solid waste and a minimal amount of liquid waste.
Pentek-603 Pretreatment Pentek, Inc.	- used to ensure proper rush removal prior to the use of PENTEK 603 - dark brown liquid - strong odor	unknown	No flash point	- Tannic acid (synonyms include tannin and gallotannic acid)	unknown	None known	The pH of this product is unknown. The TLV is unknown.	Although the pH of this product is unknown it is assumed that wastewater generated from the rinsing of coated surfaces will be in the pH range of 6 to 9.

000069

5272

Table 4-2. List of Common PCB Decontamination Chemicals.[1/]

Name/Company	General Description and Appearance and Odor	pH (standard units)	Flash Point (°F)	Constituents	Percentages of Constituents	Regulatory Considerations	Health and Safety Considerations	Waste Treatment/ Disposal Considerations
D-limonene/ Florida Chemical Company	- biodegradable solvent (terpene) occurring in nature as the main components of citrus peel oil - uses include parts clean, engine degreaser, tar and asphalt remover, grease trap maintainer, freon replacement, replacement for chlorinated solvents - clear liquid - colorless to yellow - strong citrus odor	7.5 to 8.5	115F (T Closed Cup)	- 1,methylcyclo-hexene - other terpene hydrocarbons - oxygenated compounds	95%[6/]	Although D-limonene itself does not contain hazardous constituents, many formulations of d-limonene contain emulsifiers and surfactants which themselves may contain hazardous constituents (see Triton X-100 on this table). D-limonene cleaning products can be found which do not contain hazardous constituents. Refer to Bio-T on this table.	Not listed as a carcinogen by OSHA, NTP, or IARC. FDA and FEMA list d-limonene as "generally recognized as safe." The TLV is unknown.	This product can be emulsified in water and is suitable for use with high-pressure washington. Phase separation processes may not be suitable for the treatment of this wastewater. This product is also biodegradable.
Bio-T[7/] Biochem Systems	- naturally occurring, biodegradable, multi-purpose degreaser effective for dissolving and removing grease, dirt, oil, etc. - clear yellow liquid - citrus odor	7.2 (10% aqueous solution	130F (PM Closed Cap)	- d-limonene and - other nonhazardous proprietary components	45% unknown	If the concentration of Bio-T in a wastewater is greater than 1.5%, it is probable that the flashpoint for the wastewater will be less than 140°F, and the wastewater would be considered "ignitable" under RCRA. The wastewater would be classified as a RCRA characteristic waste, D001.	This product does not contain any hazardous components as defined by the Occupational Safety and Health Administration, 29 CFR 1910.1200.	This product can be emulsified in water and is suitable fur use with high-pressure washing. Phase separation processes may not be suitable for the treatment of this wastewater. This product is also biodegradable.

000068

Table 4-2. List of Common PCB Decontamination Chemicals.[1/]

Name/Company	General Description and Appearance and Odor	pH (standard units)	Flash Point (°F)	Constituents	Percentages of Constituents	Regulatory Considerations	Health and Safety Considerations	Waste Treatment/ Disposal Considerations
Solvents								
Stoddard Solution	- petroleum-based solvent - also known as mineral spirits - light-colored liquid - kerosene-like odor	unknown	110F (Closed Cup)	- Paraffins and naphthenes - Aromatics	85 to 94% 6 to 15%		This product has a Threshold Limit Value (TLV). Refer to footnote e.	This product is insoluble in water, and is not suitable for use with high-pressure washing.
Sodium hydroxide/ Trichloroethylene	- 12% sodium hydroxide solution high-pressure wash followed by a TCE rinse			- Sodium hydroxide Trichloroethylene	12% 100%			
Trichloroethylene	- colorless liquid - irritating odor at high concentrations	unknown	None (Closed Cup)	- Trichloroethylene		The use of TCE during cleanup could be construed as a degreasing process. Spent TCE which was used as a degreaser is classified as a listed RCRA waste, F001.	Not listed as a carcinogen by OSHA, NTP, or IARC. FDA and FEMA list d-limonene as "generally recognized as safe." The TLC is unknown.	This product can be emulsified in water and is suitable for use with high-pressure washington. Phase-separation processes may not be suitable for the treatment of this wastewater. This product is also biodegradable.

000067

5772

Table 4-2. List of Common PCB Decontamination Chemicals.[1/]

Name/Company	General Description and Appearance and Odor	pH (standard units)	Flash Point (°F)	Constituents	Percentages of Constituents	Regulatory Considerations	Health and Safety Considerations	Waste Treatment/ Disposal Considerations
Detergents, Soaps, and Surfactants								
Triton X-100/ Union Carbide	- water-soluble, liquid, nonionic surfactant used in hard surface (i.e., metal, etc.) cleaning operations - used in conjunction with detergents - Transparent, pale-yellow - Mild odor	6 (5% aqueous solution)	485F (PM Closed Cup)	- Octylphenozypoly-ethoxyethanol - Polyethylene glycol - Ethylene oxide * - Dioxane * - Glycol ether +	>97% <3%	Refer to footnotes 2, 3, and 4.	Constituents of this product have Threshold Limit Values (TLVs). Refer to footnote e.	This product is soluble in water, and therefore, if Triton X-100 is used as a decontamination chemical during high-pressure washing, it will be dissolved in the resultant liquid waste stream.
BY PAS 1055 Bartlett Services, Inc.	- degreaser/cleaner - can be formulated to various concentrations depending on the application - Aqua-blue color - Mild odor	unknown	No flash point	- dipropylene glycol methyl ether - other constituents unknown	unknown		Constituents of this product have Threshold Limit Values (TLVs). Refer to footnote e.	This product is soluble in water, and therefore, if BY PAS 1055 is used as a decontamination chemical during high-pressure washing, it will be dissolved in the resultant liquid waste stream.
Foam								
CAPSUR Integrated Chemistries, Inc.	- an aqueous-based solvent foam developed specifically for the cleanup of PCB spills on solid surfaces - Clear amber liquid - Characteristic naphtha odor	11.0 (undiluted)	145F (C Open Cup)	- Naphthalene + - Trimethylbenzenes - 1,2,4-Trimethyl-benzenes + - Ethylene glycol monobutyl ether - Cyclohexanol - Monoethanolamine - Water - Surfactants	<10% >5% <10% <10% <10% <10%	Refer to footnote 4.	Constituents of this product have Threshold Limit Values (TLVs). Refer to footnote e.	This product is soluble in water, and will be dissolved in the rinsewaters used during the application of this product (refer to Section 4.1.3 for details on the application of CAPSUR).

990066

4.7 DECONTAMINATION CHEMICALS[16]

Decontamination chemicals remove contaminants from surfaces by exploiting the interaction between the chemical, the contaminant, and the contaminated surface. The primary mechanism of decontamination when using a decontamination chemical is the solubility of the contaminant in the chosen decontamination chemical.

A variety of decontamination chemicals may be used with hand scrubbing, high-pressure washing and low-pressure spraying, and the choice of an appropriate decontamination fluid is as important as the choice of decontamination methods. Categories of decontamination chemicals include the following:

- Detergents or soaps
- Foams
- Solvents
- Strippable coatings.

Table 4-2 lists commonly used PCB decontamination chemicals by category, and includes a general description of the decontamination chemicals, product pH and flashpoint, product constituents and percentages of constituents, regulatory considerations, health and safety considerations, and waste disposal considerations. Table 4-3 details decontamination efficiencies of a few of the decontamination chemicals listed in Table 4-2 (decontamination studies were not available for all of the chemicals listed in Table 4-2). Several of these chemicals may be effective at the FEMP site. However, a complete discussion of the potential effectiveness of these chemicals cannot be made at this time because the nature and extent of PCB contamination is unknown.

The following decontamination chemicals listed in Table 4-2 should not be used during the decontamination activities:

- Sodium hydroxide/trichloroethylene (TCE) - if TCE is used as a degreaser (the cleanup of the film of oil/grease/dirt/PCBs could be considered a degreasing operation), the spent TCE is classified as a listed RCRA waste,

[16]Bartlett Services Inc., Bohnen 1991, Bohnen 1992, Colburn 1991, US EPA 1985a, US EPA 1990a, Espisito 1987, Florida Chemical Company, Inc., Biochem Systems, Integrated Chemistries, Inc., McCoy and Associates, 1992, Mutch 1988, Pentek Inc., Reason 1989, ThermoCor, Union Carbide Chemicals and Plastics Company.

frequency range is above the audible range of humans and is sufficiently low to produce a strong cleaning action without requiring excessive electrical power.

The most effective ultrasonic cleaning technique will employ an ultrasonic bath with a cleaning agent or wetting solution added to a water bath. The concentration of cleaning chemicals added to the water should be on the order of 2 to 5 percent by weight, and the ultrasonic tank should be designed to provide recirculation of the cleaning solution through a cleanup filter system.

Ultrasonic cleaning techniques is effective on hard surface materials such as metals and plastics. Soft surface materials act to attenuate the ultrasonic energy thereby rendering the method ineffective on these surfaces. Ultrasonic cleaning is particularly effective on items with crevices and blind holes because the cavitation and resultant liquid agitation forces cleaning solution into cracks, crevices, blind-holes, and other hard to reach areas. Ultrasonic cleaning has been used in the nuclear industry to decontaminate small parts, hand tools, pumps, etc., and other industries have used the technique to strip paint, remove carbon deposits, and to clean jet engines and electronic parts. This method may be applicable to the interior surfaces of process equipment at the FEMP site.

4.6 VIBRATORY FINISHING[15]

Vibratory finishing involves the immersion of contaminated surfaces in tanks of cleaning solution containing metallic or ceramic abrasive media. Subsequent high frequency vibration of the tank produces mechanical scrubbing by the abrasive media. Vibratory finishing systems consist of the following: a containment tank and associated integral high frequency vibrator; ceramic, alumina-impregnated plastic, or metallic abrasive media; low-concentration flushing solution; and an ion-exchange or other waste recovery system.

Vibratory finishing has been used successfully since 1957 for the removal of rust and metal burrs and grease from irregularly shaped and interior surfaces. This surface disposal technology has also been used successfully as a gross decontamination method for nuclear reactor components, and may be applicable to process and electrical equipment at the FEMP site.

[15]Arrowsmith 1982; Fluor Technology Inc. 1988; Remark 1981; Allen 1984.

4.4 SPALLING, SCARIFYING, AND GRINDING[13]

Spalling, scarification, and grinding are specifically to decontaminate concrete and masonry surfaces by physically removing the contaminated layer of the medium. Because of the high water content of concrete, contaminates can seep into the medium rendering nondestructive decontamination techniques ineffective.

In the most common spalling technique a drill bit with expanding wedges is placed into a predrilled hole (the depth of the predrilled hole should exceed the depth of contaminant penetration). The bit wedges are then expanded and the expansion force the outer layer of contaminated material to spall. Other spalling techniques include the use of heat, pressure, chemicals, or microwaves to induce expansion and subsequent spalling of the outer layer of contaminated material.

A scarifier tool consists of pneumatically operated piston heads equipped with cutting bits. The ramming action of the tool chips off the outer layer of contaminated material. Grinding is commonly used on concrete floors and involves the used of rotating grinding wheels or discs made of abrasive materials to debrade the contaminated material. Grinding systems are available with attached vacuum systems to reduce the potential of airborne contamination.

These techniques may be applicable to building structures at the FEMP site depending on the penetration of PCBs into the structural material.

4.5 ULTRASONIC CLEANING[14]

Ultrasonics is the name given to high frequency mechanical vibrations produced in a transmission medium. High-frequency mechanical vibrations generated in a transducer and transported through a liquid impart a localized cavitation (scrubbing action) to immersed surfaces that can be effective in removing contaminants. The frequencies employed in ultrasonic cleaning are usually between 18 and 25 kilohertz (kHz). This

---

[13] IAEA 1988; IAEA 1985; Ebeling, et al. 1984, Brengle 1980; Devgun et al. 1990, Surma et al. 1990; McFarland 1980; Pentek 1992.

[14] Allen 1984; Remark 1981; Manion and LaGuardia 1980; Jones and Wakefield 1987; IAEA 1988; Remark and Miller 1980; Branson Ultrasonics Corporation; Pacific Nuclear Systems; Lewis Corporation.

An average coverage rate for non-porous, metal surfaces is 200 square feet (ft^2)/gallon of CAPSUR® decontamination chemical, although multiple applications of CAPSUR® may be required depending upon the existing concentration of PCBs, the age of the spill, the number of spills, and the porosity of the surfaces. Gross contamination such as coatings of oil, grease, dirt, etc... should be removed prior to the application of CAPSUR® to allow the decontamination chemical to intimately contact and extract PCBs from the surfaces.

The general rule-of-thumb for concrete surfaces is one CAPSUR® application for surfaces contaminated at less than 200 micrograms (ug)/100 cm^2, two CAPSUR® applications for surfaces contaminated between 200 and 800 ug/100 cm^2, and three CAPSUR applications for surfaces contaminated between 800 and 1800 ug/100 cm^2. Extraction values of less than 90 percent have occurred in cases where solvents and detergents were used prior to CAPSUR®, presumably because these solvents and detergents caused the PCB to migrate further into the contaminated surface thereby making extraction more difficult and/or because the solvents and detergents interfered with the binding of the PCBs to the CAPSUR® product.

In general, the following waste streams would result the use of the CAPSUR® system:

- Spent bristle brooms loaded with the CAPSUR® decontamination chemical and residual contamination

- Spent CAPSUR® decontamination chemical

- Rinsewaters.

The basic equipment required for the use of CAPSUR® as a foam includes a foamer unit, compressed air and a compressed air line, an industrial wet vacuum, a water supply, and personnel protective equipment.

000062

4.3.2 Foams[12]

CAPSUR®, an aqueous-based solvent system developed to extract PCBs from solid surfaces, is most effective when applied as a foam. A foam-generating unit designed to operate on an existing compressed air supply is used to apply the CAPSUR® decontamination chemical.

One CAPSUR® application consists of the following three steps:

- Step 1
    - Application of a uniform 1/2 to 1 inch thick foam blanket in 10 foot by 10 foot grids
    - Product dwell time of 5 minutes
    - Agitation of the surface with a stiff bristle industrial broom
    - Vacuuming of all free liquid from the surface
- Step 2
    - Reapplication of a uniform 1/2 to 1 inch thick foam blanket in 10 foot by 10 foot grids
    - Product dwell time of 5 minutes
    - Light coverage of surface using water
    - Vacuuming of all free liquid from the surface
- Step 3
    - Reapplication of a uniform 1/2 to 1 inch thick foam blanket in 10 foot by 10 foot grids
    - Product dwell time of 5 minutes
    - Vacuuming of the surface
    - Triple rinse (rinse and vacuum three times).

[12] Bohnen 1991, Bohnen 1992, US EPA 1985a, US EPA 1990b, Espisito 1987, Integrated Chemistries, Inc.

Self-stripping coatings are also available. The polymers used in self-stripping coatings penetrate and bond to the corrosion layer. Upon curing, the polymers contract and develop sufficient internal stress to spall the corrosion layer from the substrate. The spalled coating can be collected by vacuuming. As with other strippable coatings, application thickness must be closely controlled for to facilitate spalling. Self-strippable coatings are also water soluble, and cured coatings which fail to spall can be removed by hand scrubbing.

Strippable coatings can also be applied to protect surfaces from becoming contaminated. The coating is applied to the clean surface, and after work activities have been completed in the area, a second coating is applied over the first coating thereby trapping contamination between the two layers. The two coatings are then stripped from the protected surface.

The specific characteristics of the waste produced from strippable coatings will depend upon the material of construction of the item being decontaminated, the choice of the strippable coating(s), the choice of applicator(s), and the nature of the contamination. In general, the following waste streams would result the use of strippable coatings:

- Cured strippable coating with entrapped contaminants
- Spent applicators (if using brushes, rollers, etc...) loaded with strippable coating and residual contamination
- Rinsewaters.

Initial costs for purchasing basic equipment (e.g., low-pressure spray equipment) are relatively low, and the cost of the coatings is comparable to cost of very expensive paints. The number of personnel required to apply strippable coatings using a low-pressure spray application is minimal even for the largest surfaces, although the number of personnel required to remove the coatings is slightly higher (except for self-strippable coatings).

000060

4.3 LOW PRESSURE SPRAYING

Two types of low pressure spraying techniques are described below. Both techniques may have limited applicability to anticipated contamination at the FEMP site.

4.3.1 Strippable Coatings[11]

A strippable coating is a liquid substance that is applied to a surface and allowed to dry (most strippable coatings contain a filming agent, a complexing agent, an acid, alkali or salt, and a wetting agent). After drying, the film is stripped from the surface carrying with it a large portion of the loose contamination. The contamination is, therefore, contained in a flexible film that is safely and easily handled and stored for disposal.

Strippable coatings are normally used to decontaminate large, readily accessible surfaces. Surfaces treated have included polyvinyl chloride (PVC), polyethylene glazed ceramic, aluminum, chrome-plating, steel, glass, resin, and painted wood. Some of the specific items on which strippable coatings have successfully been employed are concrete walls and floors, epoxy painted I-beams, unpainted steel cable trays, conduits, and electrical cables.

Strippable coatings can be applied using low-pressure sprayers, or by hand (using brushes, rollers, scouring pads, squeegees etc..). Hand application of strippable coatings, although necessary in some cases, is very labor intensive and is, therefore, not recommended. An appropriate strippable coating should be chosen based on the material contaminated and the type of contamination. Gross contamination, such as coatings of oil, grease, dirt, etc... should be removed prior to the application of strippable coatings to allow the coatings to adhere to the surfaces. Further, strippable coatings will not adhere to all surfaces, such as vinyl surfaces or zinc coated surfaces, and the coatings are not easily stripped from porous or pitted surfaces. Strippable coatings must also be applied evenly and to an appropriate thickness to ensure that the cured coating is strong enough to be removed from the surface in as few pieces as possible.

[11]Bartlett Services Inc., Colburn 1991, EPA 1985a, EPA 1990b, Espisito 1987, Isley 1989, Pentek Inc., Reason 1989.

The specific characteristics of the waste produced from a pressure washing decontamination operation depend upon the material of construction of the item being decontaminated, the choice of decontamination chemicals or abrasives, and the nature of the contamination. In general, the following waste streams would result from the use of pressure washing decontamination techniques:

- Spent water/chemical solution

- Spent filters loaded with particulates (contaminants, rust, dirt, etc...) from the cleaning of the decontamination solution for reuse

- Rinsewaters.

The volume of liquid waste generated during wet pressure washing can be minimized by carefully controlling operational parameters which maximize the effectiveness of decontamination. The following operational parameters adjust the aggressiveness of wet pressure washing decontamination efforts:

- Type and size of the discharge nozzle
- Angle of projection
- Proximity of the nozzle to the surface
- Discharge pressure
- Type and concentration of chemical cleaning additives
- Type, size, and concentration of abrasive material (for wet-abrasive blasting).

The basic equipment required in a high-pressure washing system includes a water supply and pumping system, a system to combine the water and decontamination chemical or abrasive (if necessary), a hose and applicator system, and a waste collection/treatment system.

High pressure washing may be applicable to potential PCB-contaminated surfaces at the FEMP site including process equipment and building structural surfaces.

000058

4.2 HIGH PRESSURE WASHING[10]

High-pressure washing involves the propelling of substances at high pressures and/or high velocities. The propelled substances can include the following:

- Water or steam
- Detergents or soaps
- Solvents
- Abrasives.

Combinations of two or more substances, e.g., water containing detergents or abrasive materials, are common. Typical decontamination chemicals that can be used during high-pressure washing include detergents/soaps, solvents, or abrasives (refer to Section 4.7). Because a wide range of decontamination chemicals are available and suited to specific types of surfaces and contaminants, high-pressure washing systems using pressurized decontamination chemicals generally result in higher decontamination factors than water or high-pressure steam. Although contamination levels can be successively reduced using repeated pressure washings, eventually, especially for porous materials, repeated washings no longer reduce residual contamination.

Abrasive pressure washing is employed when the outer layers of the surface must be removed to achieve the required level of decontamination. Typical abrasive materials include sand, alumina, garnet, etc..., and the abrasive material can be carried by either compressed air or high-pressure water (wet-abrasive blasting). Parameters such as pressure, velocity, abrasive material, and abrasive material particle size can be varied depending on the type of surface to be contaminated and the desired decontamination rate. Wet-abrasive blasting is widely used due to the relatively low cost and high decontamination factors.

Spent decontamination chemical treatment systems (i.e., oil/water separation followed by filtration) can be included as part of the overall design of a pressure washing system. Provisions can be made for the collection and recycling of abrasive media (i.e., sand, glass beads, etc.) or for the reuse of decontamination water after oil/water separation and filtration.

---

[10]US EPA 1985a, US EPA 1990b, Espisito 1987, IT Corporation, Inc., Reason 1989, WOMA Corporation.

that the method is labor intensive.

The specific characteristics of the waste produced from washing and scrubbing will depend upon the material of construction of the item being decontaminated, the choice of decontamination solution(s), the choice of applicator(s), and the nature of the contamination. In general, the following waste streams would result from washing and scrubbing operations:

- Spent decontamination solution
- Spent applicators loaded with decontamination solution and removed contamination
- Rinsewaters.

Most of the waste produced using this technique is in solid form and is limited to the contaminants and other materials removed from the surface being decontaminated, although small amounts of liquid waste from the solvents or detergents used will also be produced. The volume of liquid waste produced can be minimized through maximizing the effectiveness of decontamination by carefully controlling operational parameters (such as choosing an appropriate decontamination solution and applicator).

Although the basic equipment required to implement hand washing consists of an applicator and decontamination chemical(s), supporting equipment will include a waste collection system and personnel protective equipment, and may include a ventilation system to remove organic vapors and airborne contaminants generated during hand scrubbing actions.

Hand scrubbing would be applicable to potential PCB-contaminated surfaces at the FEMP site. Several reservoirs of oil in process equipment which may contain PCBs, were observed during the site inspections. The surfaces of these reservoirs will require decontamination following removal of the oil, which could be accomplished by hand scrubbing.

Table 4-1. Summary of Decontamination Methods for the Removal of Surface Contamination.[1/]

Method	Cleaning Additives	Removal of Base Material	Applicability	Quantity of Waste Produced: Solid Waste[2/]	Quantity of Waste Produced: PPE[3/]	Quantity of Waste Produced: Liquid Waste	Potential Health Risks[4/]	Overall Cost
Ultrasonic Cleaning	Water with Detergents, Solvents, and/or Abrasives	None	Internal and external contamination on removable parts	Small to moderate	Small	Small to moderate	Low	Low to moderate
Vibratory Finishing	Water with Abrasives, Detergents, and/or Solvents	Slight to moderate	External contamination on removable parts	Small to moderate	Small	Moderate	Low	Low to moderate
In-situ Chemical Dechlorination	Dechlorination Chemicals SEA Marconi Reagent	Possible degradation of the contaminated surface	External surface contamination	Small	Moderate	Small	Moderate	Low to moderate
Spalling, Scarification, and Grinding	NA	High	External surface contamination - concrete and masonry surfaces only	Large	Large	Small	Moderate	Low to moderate

1/ This table has been adapted and developed based on professional engineering judgement and information contained in the following references: Barkley 1990, EPA 1985a, EPA 1990b, Espisito 1987, and IT Corporation, Inc.

2/ Excluding spent personal protective equipment (PPE).

3/ The volume of PPE has been estimated based on engineering judgement for comparative purposes. These estimates should be refined when data is available regarding the nature and extent of contamination and based on specific site requirements for the type of contamination defined.

4/ The potential health hazards have been qualitatively evaluated based on engineering judgement. These evaluations should be reexamined when data is available regarding the nature and extent of contamination. These evaluations are relative only and have no quantitative meaning.

000055

5272

Table 4-1. Summary of Decontamination Methods for the Removal of Surface Contamination.[1/]

Method	Cleaning Additives	Removal of Base Material	Applicability	Quantity of Waste Produced: Solid Waste[2/]	Quantity of Waste Produced: PPE[3/]	Quantity of Waste Produced: Liquid Waste	Potential Health Risks[4/]	Overall Cost
Adsorption	Adsorbents	None	Liquid contamination on external surfaces	Dependant on quantity of liquid to be adsorbed	Small	Small	Low	Low
Vacuuming	NA	None	Dry contamination on external surfaces	Small	Small	Small	Low	Low
Hand Scrubbing	Water with Detergents and/or Solvents	None	Contamination on external surfaces	Small	Small	Small	Moderate	High
Low Pressure Spray < 5,000 psi	Foam Strippable coatings	None	Internal and external surface contamination	Small	Moderate	Moderate to large	Moderate	Moderate
Dry-Abrasive Blasting (also known as sandblasting or gritblasting)	Air with Abrasives	Capable of severe abrasion	External surface contamination	Large	Large	Small	High	Moderate to high
High Pressure Washing < 10,000 psi	Water with Detergents, Solvents, and/or Abrasives	Negligible	Internal and external surface contamination	Small to moderate	Large	Moderate to large	High	Moderate
Ultra-high Pressure Washing > 10,000 psi	Water with Detergents, Solvents, and/or Abrasives	Slight	Internal and external surface contamination	Small to moderate	Large	Moderate to large	High	Moderate to high

4.0 PCB DECONTAMINATION METHODS AND CHEMICALS

A variety of contaminated surfaces will be encountered during the implementation of OU3 remedial actions. These surfaces may be contaminated with PCBs, radionuclides, or both. A proven approach to waste minimization is decontamination prior to demolition. Table 4-1 overviews the decontamination methods for the removal of PCBs from contaminated surfaces, and includes information on potential decontamination chemicals, base metal removal, applicability, quantity of waste produced, overall cost, and whether the method is applicable and appropriate to the FEMP. Although these methods are reviewed in the context of PCB contamination, they will be generally applicable to building surfaces and process equipment that are also contaminated with radioactive materials. The specific applicability and use of any of these methods will need to be determined during the planning for each demolition and decommissioning effort, in conformance with approved Standard Operating Procedures (SOPs), and with special consideration to safety concerns.

4.1 HAND SCRUBBING[9]

Hand scrubbing typically involves the chemical action of decontamination chemicals on contaminated surfaces in combination with the mechanical action of brushes, swabs, pads, or cloths. Hand-held power tools may also be used for cleaning. A variety of decontamination chemicals including water, detergents/soaps, and/or commercial solvents can be used depending on the application (refer to Section 4.7), and a variety of applicators can also be used including cloths, cotton swabs, abrasive brushes, and long-handled mops. Washing and scrubbing techniques are primarily applied to cleaning of exterior surfaces; however, special brushes and other devices have been developed for cleaning internal surfaces of pipes, etc. Washing and scrubbing is often used to remove gross contamination because of the difficulty in removing contamination from porous, pitted, or rusted surfaces.

The primary advantage of hand scrubbing is that the process is simple in that the mechanical and chemical forces are applied directly to the item/surface undergoing decontamination, and can result in high decontamination factors depending on the surface type and nature of the contamination. The disadvantage of hand scrubbing is

[9]USEPA 1985a, USEPA 1990b, Espisito 1987, Reason 1989.

The application of these solid waste volume reduction technologies should be assessed against detailed waste stream characterization information, and consideration should be given to secondary waste generation.

contamination it can be regenerated or disposed. Currently, carbon loaded with PCBs must be incinerated.

The application of phase separation, membrane filtration, or activated carbon volume reduction technologies should be assessed against detailed waste stream characterization information, and consideration should be given to secondary waste generation.

Large quantities of PCB contaminated debris (e.g., scrap metal, drums, equipment, tools, brick, concrete block, and plastic) may be decontaminated, thereby reducing the volume of contaminated solid waste, using washing systems such as the Debris Washing System[7] (DWS) developed by the US EPA's Risk Reduction Engineering Laboratory and IT Corporation or the Decontamination and Volume Reduction Facility[8] (DVRF) developed by EkoTek, Inc.

The DWS entails application of an aqueous solution during a high pressure spray cycle followed by turbulent wash and rinse cycles. The DWS is comprised of 300-gallon spray and wash tanks, surfactant and rinse holding tanks, and an oil-water separator. Both bench-scale and pilot scale versions of the system have been designed, constructed, and tested (contaminants investigated included PCBs, pesticides, and lead), and the system has been evaluated as part of the US EPA's SITE Program. The DWS has been used at the Industrial Superfund Site in Detroit, Michigan, the Gray PCB Site in Hopkinsville, Kentucky, and the Shaver's Farm Drum Disposal Site in Chickamuauga Georgia.

The DVRF was designed and constructed in conjunction with a comprehensive non-destructive assay (NDA) system for the decommissioning of Nuclear Fuel Services Inc. mixed oxide fuel fabrication facility. The DVRF employs a high pressure water housed in a stainless steel enclosure and uses recirculated water for decontamination activities. Rapid volume reduction is accomplished using a high-capacity shear-baler that produces compacted bales of material with an average density of 1 gram per square centimeter (g/cm^2). As of November 1991 approximately 200 cubic meters (m^3) of gloveboxes, laboratory equipment, fuel processing equipment, piping, and duct work had been successfully processed through the DVRF.

---

[7] USEPA 1991c, Journal of Air and Waste Management 1992

[8] American Nuclear Society 1991

- Phase separation
- Membrane filtration
- Adsorption processes.

Phase separation involves the separation of the oil phase from the aqueous phase of a waste stream. Polymer may be added to aid in oil/water separation, and the residuals produced from the oil/water separation include a floating oil-phase material and underlying aqueous-phase material. The separated oil-phase material, which should contain the majority of the PCBs, would require further treatment (e.g., chemical treatment, incineration, etc.). The separated aqueous-phase material, which could also contain trace amounts of PCBs, may require further treatment (e.g., carbon adsorption, chemical treatment, etc.). Phase separation is not appropriate for emulsified oils.

Membrane filtration also involves the separation of the oil phase from the aqueous phase of a waste stream. Membrane filtration processes are particularly applicable in the treatment of emulsified oily wastewaters. Volume reductions of greater than 99 percent can be achieved on oily wastewater streams using ultrafiltration processes. The residuals from ultrafiltration include the concentrated oil-phase (the concentrated phase may be as high as 25 percent oil). The separated oil-phase material, which should contain the majority of the PCBs, would require further treatment (e.g., chemical treatment, incineration, etc.). The separated aqueous-phase, which could also contain trace amounts of PCBs, may require further treatment (e.g., carbon adsorption, chemical treatment, etc.). The concentrated oil-phase material would be ideal for incineration as it should have a fairly high British thermal unit (BTU) value.

Activated carbon, an adsorption process, removes PCBs from aqueous liquid wastestreams by binding the PCB to a solid activated carbon substrate. Carbon adsorption is particularly applicable to the removal of PCBs from an aqueous wastestream because PCBs have a high affinity for carbon and are only slightly soluble in water. However, the presence of other contaminants in the wastestream, such as detergents or other organic constituents, can negatively affect the removal of PCBs because activated carbon does not selectively remove one contaminant. Because activated carbon columns become plugged by free oils and particulate material, oils and particulates should be removed from the aqueous wastestream prior to processing aqueous PCB-contaminated wastewater. When the carbon media becomes saturated with

Table 3-3. Innovative Disposal Technologies in Use or Planned for Use at Remediation Sites.[1/]

Technology Type	Site Name, State, Agency, Contact	PCB Contaminated Media: Type and Quantity Treated	Status
Thermal Desorption	- Carter Industries - Michigan - U.S. EPA Region 5 - J. Peterson, 312-353-1264	Soil and debris: 46,000 cy combined	Predesign phase. Treatability studies are underway- specific vendor has not yet been chosen.
Thermal Desorption	- Martin Marietta - Denver Aerospace - Colorado - U.S. EPA Region 8 - G. Dancik, 303-293-1506 or - S. Chaki, 303-331-4832	Soil: 2,300 cy	Predesign phase. Treatability studies are underway- specific vendor has not yet been chosen.
Soil Washing (Bergmann USA)	- Saginaw Bay Confined - Disposal Facility, U.S. Army - Michigan - U.S. EPA Region 5 - J. Galloway, USACE 313-226-6760 - R. Traver, Bergmann 615-230-2100	Sediments: 150 cy	Remediation completed in the summer of 1992. Washed sediments left at facility, wastewater discharged to confined disposal facility.

1/ References: EPA 1992 and personal communications with listed contacts.

Table 3-3. Innovative Disposal Technologies in Use or Planned for Use at Remediation Sites.[1/]

Technology Type	Site Name, State, Agency, Contact	PCB Contaminated Media: Type and Quantity Treated	Status
Dechlorination (BCDP)	- U.S. Public Works Center - Guam, U.S. Navy - U.S. EPA Region 9 - D. Chan, 805-982-4191	Soil: 5,500 tons	Installation underway
Solvent Extraction (BEST)	- General Refining Company - Georgia - U.S. EPA Region 4 - S. Hitchcock, 404-347-3931	Soil and sludge: 2,700 cy Solids: 700 cy Waste oil: 6,600 gal	Remediation completed in February 1987. Oil used as fuel for kiln, water treated/discharged off-site, solids solidified and disposed of on-site.
Solvent Extraction	- Carolina Transformer - North Carolina - U.S. EPA Region 4 - M. Townsend, 404-347-7791	Soil: 15,000 cy	Predesign phase
Thermal Desorption (X-TRAX)	- Re-Solve - Massachusetts - U.S. EPA Region 1 - L. Thantu, 617-223-5500	Soil: 22,500 cy	Design complete. Installation early 1993
Thermal Desorption	- Solvent Savers - New York - U.S. EPA Region 2 - L. Wong, 212-264-9348	Soil: 60,000 cy	Predesign phase
Thermal Desorption	- Sangamo/Twelve Mile - Hartwell PCB, OU1 - South Carolina - U.S. EPA Region 4 - B. Hayes, 404-347-7791	Soil: 100,000 cy	Predesign phase. Treatability studies are underway- specific vendor has not yet been chosen.
Thermal Desorption (SoilTech ATP)	- Outboard Marine Corp. - Waukegan Harbor, OU3 - Illinois - U.S. EPA Region 5 - R. Bowlen, 312-353-6316	Soil and sediments: 16,000 cy combined	Remediation completed in the summer of 1992. 99% reduction in PCB levels. Treated soil and sediment stored on-site, wastewater

Table 3-3. Innovative Disposal Technologies in Use or Planned for Use at Remediation Sites.[1/]

Technology Type	Site Name, State, Agency, Contact	PCB Contaminated Media: Type and Quantity Treated	Status
Ex-situ bioremediation	- General Motors, - Central Foundary Div., OU1 - New York - U.S. EPA Region 2 - L. Carson, 212-264-6857	Soil: 100,000 cy Sludge: 91,000 cy Sediments: 62,000 cy	Design phase. Several technologies are under evaluation including thermal, chemical, and biological treatment.
Ex-situ bioremediation	- General Motors - Central Foundary Div., OU2 - New York - U.S. EPA Region 2 - L. Carson, 212-264-6857	Soil, sludge, debris: 600,000 cy combined	Predesign phase. Several technologies are under evaluation including thermal, chemical, and biological treatment.
Dechlorination	- Re-Solve - Massachusetts - U.S. EPA Region 1 - L. Thantu, 617-223-5500	Liquid: residuals from the thermal desorption of 22,500 cy of soil	Design complete. Installation early 1993
Dechlorination (APEG) Thermal Desorption (SoilTech ATP)	- Wide Beach Development - New York - U.S. EPA Region 2 - H. King, 212-264-1129	Soil: 40,000 cy	Remediation completed in September 1991. Treated soil disposed of on-site.
Chemical treatment, low-temperature thermal treatment, physical treatment	- Smith's Farm - OU1 - Kentucky - U.S. EPA Region 4 - T. DeAngelo, 404-347-7791	Soil: 16,000 cy	Design complete. Specific vendors for the various technologies have not been chosen yet.
Dechlorination (KPEG/EPA)	- Tenth Street Dump/Junkyard - Oklahoma - U.S. EPA Region 6 - M. Overbay, 214-655-8512	Soil: 10,000 cy	Design phase. Dechlorination is being reevaluated because of problems experienced at other sites (e.g., odor, sticky-wet product, necessary stabilization, increase in material volume).

Table 3-2. Innovative PCB Disposal Technologies.[1]

Process Name/Vendor	Process Description	Applicability
Physical Treatment[4] (continued)		
Solidification/IM-TECH	Immobilizes contaminants in soils and sludges by binding them into a concrete-like, leach-resistant mass. A patented additive, Chloranan, is added to cement or flyash that encapsulates organic and inorganic molecules. Evaluated as part of EPA SITE program.	Soils, sludges and sediments. Also oily sludges and sediments
Activated Carbon/Various	Uses activated carbon adsorption as a polishing process for the removal of trace amounts of PCBs from water streams. There are limited facilities permitted at this time to thermally regenerate carbon contaminated with PCBs.	Water
Biological Treatment[5]		
Digestion/Motec, Inc.	Organic wastes are solubilized into the aqueous phase in a high energy environment. Microorganisms are then used to degrade or detoxify the organic constituents. Used at Superfund Site as part of EPA SITE program.	Liquids, sludges, and soils
White Rot Fungus/C-E Environmental, Inc.	Uses fixed film bioreactor to maintain white rot fungus (Phanerochaete chrysosporium) and treat contaminated waters.	Liquids
Toxigon/Formula IV Corporation	System comprised of emulsifier, nutrient blend, and dehydrated microbes customized to treat the constituents of concern.	Liquids, soils, and sludges.
Bioremediation/SBP Technologies, Inc.	Uses a membrane filtration unit to concentrate contaminants followed by a bioreactor to degrade and destroy organics. Uses proprietary microorganism mixtures. Evaluated as part of EPA SITE program.	Waters and slurries

1/ The information presented in this table is compiled from literature reviews and information gained through telephone contacts. It is possible that this list is not a complete and exhaustive list of all innovative technologies.
2/ References: Ackerman 1983, Boyd 1986, EPA 1987, EPA 1990b, EPA 1991a, EPA 1991b, Canonie Environmental, Chemical Waste Management.
3/ References: EPA 1985b, EPA 1990c, EPA 1990d, Galson 1992, MODAR 1988, Staszak 1987.
4/ References: Detox Industries, McCoy and Associates 1989.
5/ References: Carpenter 1986, EPA 1989b, EPA 1990b, EPA 1990d, EPA 1990e.

000046

Table 3-2. Innovative PCB Disposal Technologies.[1]

Process Name/Vendor	Process Description	Applicability
Physical Treatment[4]		
Solvent Extraction/CF Systems	Uses liquified hydrocarbon gas for separating organic contaminants from soils, sludges, sediments and liquids. Technology demonstrated at two Superfund Sites as part of EPA SITE Program. Available as an onsite process.[3]	Liquids, solids, sludges with organic contamination
BEST/Resources Conservation Company	Basic Extractive Sludge Treatment (BEST). Chemically enhanced separation technique for separation of PCB contaminated wastes into three components: oil and organics, water, and dry oil-free solids. Evaluated as part of EPA SITE program, and used at the General Refining Company Superfund Site. Process is negatively affected by detergents and emulsifiers.	Pumpable or slurried into a pumpable form.
Solvent Extraction/ENSR	Mobile solvent extraction system for soils and sludges at a rate of 5 to 10 cubic yards per hour. Only performance data is from bench-scale testing.	Soils and sludges
Extraksol/Sanivan Group	Solvent extraction process that uses a proprietary solvent for treatment of contaminated soils, sludges, and sediments. Mobile unit capable of 1 ton per hour.	Soils, sludges, and sediments
Low Energy Extraction Process/ ART International, Inc.	Solvent extraction process that uses common hydrophobic and hydrophilic organic solvents to extract and further concentrate organic pollutants. Solvents are selected so they can be readily recycled at low energy cost. Evaluated as part of EPA SITE program.	Soils, sludges and sediments
Carver-Greenfield Extraction/ Dehydro-Tech Corporation	Uses food-grade carrier oil to extract the oil soluble contaminants from wastes. The carrier oil is mixed with the waste and the mixture placed in an evaporation system to remove excess water. Then the carrier oil is separated from the solids and the carrier oil is recovered. Evaluated as part of EPA SITE Program.	Soils, sludges, and sediments. Also used slop oils.
Solidification/Soliditech, Inc.	Uses Portland cement or other pozzolanic material to aid in the physical and chemical immobilization of the hazardous constituents. Evaluated as part of EPA SITE program.	Soils, sludges, and sediments. Also oily sludges.

000045

8272

Process Name/Vendor	Process Description	Applicability
Chemical Treatment[3/]		
KPEG/EPA	Uses potassium polyethylene glycolate (solution of potassium hydroxide and polyethylene glycol) for chemical destruction of PCBs. The mixture of waste and chemicals is heated and then allowed to react for several hours. EPA has a mobile unit mounted on a 45-foot trailer.	Soils, sludges, and liquids including waste oils and solvents
APEG-PLUS/Galson Remediation Corporation	Process uses an alkaline solution of potassium hydroxide and polyethylene glycol to react with and removes the chlorine molecules of PCBs. Used in cleanup of Wide Beach Superfund Site.	Soils, sludges, and oils.
Base-Catalyzed Decomposition Process (BCDP)/Risk Reduction Engineering Laboratory (EPA)	Mixes chemicals (not polyethylene glycol) with contaminated media and heats to 340 degrees Celsius for several hours. The offgases are treated before release and toxic contaminants in the contaminated media are destroyed. The process has been evaluated as part of the SITE program.	Soils, sludges and liquids
KGME Chemical Waste Management	Dechlorinates PCBs using a potassium glycol methyl etherate mixture.	Soil
Ultraviolet Oxidation/Ultrox	Oxidation process that destroys organic compounds. Ultraviolet light, ozone and hydrogen peroxide generate free radicals which readily react with organic molecules. Evaluated as part of EPA SITE program.	Liquids contaminated with chlorinated organics.
Ultraviolet Oxidation/Peroxidation Systems, Inc.	Oxidation process that destroys organic compounds. Ultraviolet light, hydrogen peroxide generate free radicals which readily react with organic molecules. Evaluated as part of EPA SITE program.	Liquids contaminated with chlorinated organics.
Photocatalytic Oxidation/Nutech Environmental	Uses illuminated titanium dioxide to promote the formation of hydroxide radicals that will oxidize organic contaminants. Evaluated as part of EPA SITE program.	Water
X-Ray Treatment/Pulse Sciences, Inc.	Use of X-rays to produce deeply penetrating ionizing radiation which promotes the formation of hydroxide radicals. The hydroxide radicals oxidize organic contaminants to water, carbon dioxide, and inorganic elements. Evaluated as part of EPA SITE program.	Soil and water
Supercritical Water/MODAR, Inc.	Water is used in its supercritical state to oxidize and effectively destroy toxic organic compounds.	Aqueous and organic liquids.

Table 3-2. Innovative PCB Disposal Technologies.[1/]

Process Name/Vendor	Process Description	Applicability
Thermal Treatment[2/]		
Pyroplasma Plasma Torch/Westinghouse Electric Corporation	Uses electric power across a colinear electrode assembly to produce an electric arc which causes an injected low pressure air stream to be ionized, forming a thermal plasma with temperatures in the 5,000 to 15,000 degree Celsius range. Waste molecules are completely dissociated into their atomic components by the plasma. Evaluated as part of the EPA SITE program.	Liquids and pumpable wastes. Chlorinated organics and petroleum compounds.
Advanced Electric Reactor/Huber Technology Group	Electrically-heated pyrolytic reactor near infrared. Porous, vertical reactor core made of graphite radiates heats of up to 500,000 degree Celsius per second. Organic constituents are rapidly vaporized and decompose to elemental forms.	Soils and concentrated liquids. PCBs, carbon tetrachloride, dioxins.
Infrared Thermal Destruction/ Ecova Corporation	Electrically powered silicon carbide rods are used to heat organic wastes to combustion temperature. The off-gas stream is treated in an afterburner. Appropriate for moisture contents of up to 50%. Evaluated as part of the EPA SITE program.	Soils, sludges and oily sludges
Anaerobic Thermal Process/ SoilTech ATP Systems, Inc.	Single, horizontal, rotating unit with preheat zone, reaction zone, and combustion zone. Anaerobic vaporizing of water and light hydrocarbons in the preheat zone, anaerobic distillation of heavy hydrocarbons in the reaction zone, and oxidation of carbon residues in the combustion zone. Process used at the Wide Beach Superfund Site and the Outboard Marine Corporation Site. SoilTech ATP Systems, Inc. is a subsidiary of Canonie Environmental Services Corp. and UMATAC Industrial Processes.	Soils, sludges, emulsions. Process under development for the treatment of other waste types.
X-TRAX Chemical Waste Management	System consists of an indirectly fired rotary dryer and gas treatment system. Nitrogen is used as an inert carrier gas to transport vaporized compounds to the gas treatment system. Liquid condensed streams are combined and gravity separated. X-TRAX system has undergone pilot testing, and a full-scale commercial X-TRAX unit is planned for use at the Re-Solve Superfund Site. Works best on soils with less than 10 percent organic contaminant concentrations.	Soil

000043

5772

3.2 INNOVATIVE PCB DISPOSAL TECHNOLOGIES

Superfund sites, Department of Defense (DOD) sites, and DOE sites often use innovative disposal technologies[6] during site remediation. The major innovative disposal technologies applicable to PCB disposal include the following:

- Thermal treatment
- Chemical treatment (i.e., oxidation and chemical dechlorination)
- Ex-situ biological treatment
- Physical treatment (i.e., solvent extraction, solidification, and adsorption).

Table 3-2 overviews applicable PCB innovation disposal technologies. Although these innovative disposal technologies are not commercially permitted, it is possible that some of the listed technologies will be commercially permitted by the time the removal of PCBs and PCB Items from buildings and structures within OU3 begins. Currently, the innovative PCB technologies listed are not being used on low-level radioactive PCBs. Therefore, their applicability to FEMP radioactive PCBs is uncertain.

Table 3-3 overviews PCB innovative disposal technologies that have been recently used at remediation sites or which are planned for use at remediation sites, and the specific vendor technology used at the site has been noted when available.

3.3 LIQUID AND SOLID WASTE VOLUME REDUCTION TECHNOLOGIES

A number of volume reduction technologies have been identified by the US EPA for use in managing nonradioactive PCBs. These technologies, and their application to liquid and solid wastes, are discussed below. Currently, these volume reduction technologies are not being used on low-level radioactive PCBs. Therefore, their applicability to FEMP radioactive PCBs is uncertain.

The volume reduction technologies that may be appropriate for a primarily aqueous waste stream that may contain suspended solids (including grit, rust, and dirt), oils, greases, and decontamination chemicals include the following:

---

[6] Innovative treatment technologies are alternative treatment technologies (alternative treatment technologies are technologies which offer an alternative to land disposal) that have limited data on cost and performance because the technologies are under development.

Table 3-1. Survey of Permitted Commercial PCB Disposal Facilities.[1/]

Company	Address/Phone Number	Comments
Other		
FulCircle Ballast Recyclers	509 Manida Street Bronx, NY 10474 212-328-4667 617-876-2229	Process fluorescent light ballasts by separating the PCB capacitor and PCB-contaminated asphalt potting soil from the copper coils, wires, etc... The PCB capacitor and contaminated asphalt potting material is incinerated while the metal material is smelted and recycled. Cannot accept low-level radioactive PCB wastes.

1/ The list of companies in this table is based on information received from the TSCA Hotline and EPA Region 5. The companies were contacted to update the information received from EPA. The information is that which the company provided regarding the types and forms of wastes they accept. Omission of information regarding acceptance of RCRA or radiological waste types indicates that the company does not accept that waste material, is unsure of their permit status regarding other waste types, or will not accept waste types other than those specified. All commercial PCB disposal facilities have background radioactive constituent acceptance criteria. However, the disposal of radioactively contaminated PCB solids having activity background, is generally not acceptable without permit revisions.
3/ Company was contacted in writing. Responses are presented in Appendix B.
4/ Permitted to operate in EPA Region 5.
5/ Permitted to operate in all ten EPA Regions.

000041

5722

Table 3-1. Survey of Permitted Commercial PCB Disposal Facilities.[1/]

Company	Address/Phone Number	Comments
Chemical Waste Landfills (continued)		
Chemical Waste Management (also known as CWM	1550 Balmer Road Model City, NY 14107 716-754-8231	Landfill of solids (TSCA and RCRA). Transformer decommissioning capabilities.
U.S. Ecology, Inc.	Box 578 Beatty, NV 89003 702-553-2203	Landfill of solids (TSCA and RCRA) including small capacitors. Can also perform transformer decommissioning - oily waste shipped elsewhere for incineration.
U.S. Pollution Control, Inc.	Grayback Mountain 8960 N. Highway 40 Lake Point, UT 84074 801-595-3900	Landfill of solids (TSCA). Also transformer draining and flushing, chemical treatment of PCB contaminated oil, and solidification services. RCRA wastes on individual basis.
Biological		
Detox Industries, Inc.[2/]	12919 Dairy Ashford Sugar Land, TX 77478 713-759-5167	Can handle oils, waters or sludges with onsite bioreactor system. Can biologically treat low-level PCB liquids; will require treatability testing. May be able to custom design and construct a radioactive PCB destruction system.

000040

Table 3-1. Survey of Permitted Commercial PCB Disposal Facilities.[1/]

Company	Address/Phone Number	Comments
PCB Transformer Decommissioning		
Aptus, Inc.[2/]	P.O. Box 1328 Coffeyville, KS 67337 316-251-6380	Transformer/capacitor decommissioning, solvent recovery, chemical treatment, and incineration capabilities. Cannot accept low-level radioactive PCB wastes.
Unison (formerly G&L Recovery Systems)[3/]	1302 West 38th Street Ashtabula, OH 44004 800-544-0030	Transformers and capacitors destruction services (TRANS-END), retrofitting service, and disposal of PCB lighting ballasts, debris, and soil. Cannot accept low-level radioactive PCB wastes.
Transformer Consultants (Division of S.D. Meyers, Inc.)[3/]	180 South Avenue Tallmadge, OH 44278 800-444-9580	Transformer and capacitor dissassembly and destruction, retrofill. Cannot accept low-level radioactive PCB wastes.
Chemical Waste Landfills		
CECOS International[3/]	5092 Aber Road Williamsburg, OH 45176	New York landfill facility accepts only RCRA liquieds. Cannot accept low-level radioactive PCB wastes.
Chemical Waste Management	Alabama, Inc., Box 55 Emelle, AL 35459 205-652-9721	Landfill of solids (TSCA and RCRA). Transformer and capacitor decommissioning services. Cannot accept low-level radioactive PCB wastes.
Chemical Waste Management	Box 471 Kettleman City, CA 93239 209-386-9711	Landfill of solids (RCRA/TSCA) including small capacitors. Can also perform transformer decommissioning-transfer oily waste to other facilities for disposal.
Chemical Waste Management (formerly Chem-Security Systems, Inc.)	Star Route, Box 9 Arlington, OR 98712 503-454-2643	Landfill of solids (TSCA). Transformer decommissioning capabilities.
Envirosafe Services of Idaho, Inc.	P.O. Box 16217 Boise, ID 83715-6217 800-727-9969 800-274-1516	Landfill of solids (TSCA and RCRA) including small capacitors. Can also perform transformer decommissioning - oily waste shipped elsewhere for incineration.

Company	Address/Phone Number	Comments
Chemical Treatment (continued)		
Trinity Chemical Company	6405 Metcalf, Cloverleaf 3 Suite 313 Shawnee Mission, KS 66202 316-328-3222	Chemical dechlorination of dielectic fluid with PCB concentrations less than 18,000 ppm. Require sample for treatability testing prior to acceptance. Treated oil is recycled. Cannot accept RCRA waste.
Physical Separation		
Southdown Environmental (formerly CECOS International Process Center)	Spring Grove Resource Recovery 4879 Spring Grove Avenue Cincinnati, OH 45232 513-681-5738	This facility is in the process of being repermitted for RCRA and TSCA wastes.
Aptus, Inc.	P.O. Box 1328 Coffeyville, KS 67337 316-251-6380	Solvent recovery, transform/capacitor decommissioning, chemical treatment, and incineration capabilities. Cannot accept low-level radioactive PCB wastes.
Unison Transformer Services, Inc.	5801 Riverpoint Road Henderson, KY 43420 800-544-0030	Transformers and capacitors destruction service (TRANS-END), retrofitting service, and disposal of PCB lighting ballasts, debris, and soil. Cannot accept low-level radioactive PCB wastes.
Quadrex HPS, Inc.[2/, 4/]	1940 N.W. 67th Place Gainesville, FL 32606 904-373-6066, -0040	Field services group does high-pressure spray washing for PCB remediation activities. Solvents etc... used in cleaning activites separated from waste stream - broker disposal of PCB waste. May be able to treat low-level mixed PCB waste but require information. Part B permit for RCRA wastes.
S.D. Meyers, Inc.	180 South Avenue Tallmadge, OH 44278 800-444-9580	Transformer and capacitor dissassembly and destruction, retrofill, PCB spill cleanup, chemical treatment of PCB oil (PCB-Gone). Cannot accept low-level radioactive PCB wastes.

Table 3-1. Survey of Permitted Commercial PCB Disposal Facilities.[1]

Company	Address/Phone Number	Comments
Alternate Thermal (continued)		
O.H. Materials Corporation[4]	16406 U.S. Route 224 East P.O. Box 551 Findlay, OH 45839 800-537-9540	Mobile incinerator for large quantities of soils (TSCA only, no RCRA wastes). Firm also performs onsite remediation, can broker disposal of liquid wastes, and has other thermal treatment units available.
Chemical Treatment		
Chemical Waste Management[2]	1550 Balmer Road Model City, NY 14107 716-754-8231	Landfill of TSCA and RCRA solids. Also perform waste stabilization, neutralization of acids and bases. May accept FEMP wastes if radioactivity levels are below permit restriction of 0.02 millirem per hour.
General Electric	One River Road Schenectady, NY 12345 518-385-2426, -9763	Chemical treatment of PCB transformer mineral oil with PCB concentrations of less than 2500 ppm. Although the chemical treatment unit is mobile, the normal operating capacity is 0.5 million gallons and therefore usually used as an off-site high volume facility.
Aptus, Inc.[2]	P.O. Box 1328 Coffeyville, KS 67337 316-251-6380	Liquid and solid waste for incineration (TSCA and RCRA). Also have solvent recovery, transformer dismantling, and chemical treatment capabilities. Transfer and storage facility in Minnesota. Cannot accept low-level radioactive PCB oil and debris.
PPM, Inc. (USPCI Subsidiary)[4]	1875 Forge Street Tucker, Georgia 30084 404-934-0902	Chemical treatment facilities in Georgia and Utah for PCBs in mineral oils only with concentrations up to 10,700 ppm (TSCA only, no RCRA). Cannot treat petroleum-based or water wastes. Utah facility can landfill PCB solid waste. Cannot accept low-level radioactive PCB wastes.
ENSR Operations (formerly Sunohio)[3, 4]	1700 Gateway Blvd. S.E. Canton, OH 44707 216-452-0837 216-430-4775	Chemical treatment (PCBX) of transformer mineral oil with PCB concentrations less than 14,000 ppm. Off-site or on-site capabilities. Askaral transformer reclassification (System 50).
Transformer Consultants (Division of S.D. Meyers, Inc.)[3, 4]	P.O. Box 4724 Akron, OH 44310 800-444-9580	Chemical dechlorination (PCB-Gone) of PCB contaminated oil with concentrations less than 5000 ppm. Also perform transformer, capacitor, etc... dissassembly.

Table 3-1. Survey of Permitted Commercial PCB Disposal Facilities.[1/]

Company	Address/Phone Number	Comments
Incineration		
Aptus, Inc.[2/]	P.O. Box 1328 Coffeyville, KS 67337 316-251-6380	Liquid and solid waste for incineration (TSCA and RCRA). Also have solvent recovery, transformer dismantling, and chemical treatment capabilities. Transfer and storage facility in Minnesota. Cannot accept low-level radioactive PCB oil and debris.
Aptus, Inc. (Permit Pending)	P.O. Box 27448 Salt Lake City, UT 801-531-4200 (March 93) 1160 N. Aptus Road Aragonite, UT	Liquid and solid waste (TSCA and RCRA) incinerator currently in the Demonstration Approval stage. Final permit is expected to be issued in April 1993. Cannot accept low-level radioactive PCB materials.
Chemical Waste Management	P.O. Box 2563 Port Arthur, TX 77643 409-736-2821	TSCA and RCRA bulk solid and liquid waste incineration facility in Port Arthur, Texas. Residual ash from the incineration process is landfilled. Cannot accept low-level radioactive PCB materials.
Rollins Environmental	P.O. Box 609 Deer Park, TX 77563 713-930-2300	Liquid and solid waste (RCRA and TSCA) incineration facility in Deer Park, Texas. No restrictions on waste form or concentration. Cannot accept low-level radioactive materials.
U.S. DOE/Martin Marietta Energy Systems	Federal Office Building Room G-108, P.O. Box E Oak Ridge, TN 37830 615-576-0973, -8799 615-574-1803	Incineration facility which can accept liquid waste (TSCA, RCRA, and low-level radioactive material). Treat only mixed or radioactive waste from DOE facilities. Agreements in place to take waste from Fernald site.
WESTON[4/]	One Weston Way West Chester, PA 19380 215-692-3030	Two permitted mobile soils and sludge incinerators (TSCA and RCRA). One will treat 4 to 12 tons per hour and the other will treat up to 50 tons per hour. Treatment dependent upon BTU content and moisture content.
Alternate Thermal		
General Electric	100 Woodlawn Avenue Pittsfield, MA 01201 413-494-2700, -2165 413-442-4635	Thermal oxidizer for transformer PCB oil located in Pittsfield, MA. Cannot accept solid material or RCRA waste.

5772

- Alternative Disposal Methods.

Alternative disposal methods may include alternative thermal treatment (other than incineration), chemical treatment, physical treatment, and biological treatment.

Appendix A contains the lists of "PCB DISPOSAL COMPANIES COMMERCIALLY PERMITTED" obtained from the TSCA Hotline and from US EPA Region 5. All of the companies listed in either the TSCA Hotline list or the US EPA Region 5 list were contacted to create an up-to-date comprehensive list. Because the disposal of PCB-containing wastes is a rapidly changing industry, several of the companies in the TSCA Hotline or US EPA Region 5 lists no longer dispose of PCBs. These companies are so noted in Appendix A, but are not considered further in this report.

Table 3-1 is arranged by disposal technology (i.e., incineration, alternate thermal treatment, chemical treatment, physical separation, and biological) and details the results of the survey of these companies. A sampling of companies listed in Table 3-1 were contacted in writing to determine if their facilities were capable of treating the low-level radioactive PCB oils and debris currently stored at the FEMP. The comments of the companies who evaluated their ability to treat low-level radioactive PCBs are included in Table 3-1 and discussed in Section 5.0.

None of the companies contacted during the survey, with the exception of the DOE TSCA Oak Ridge Incinerator, indicated the ability to accept PCBs with other than background concentrations of radionuclides. Of the companies contacted, Rollins Environmental was the most specific concerning radionuclide limitations, while the majority of the other companies simply referenced background but could not supply any specific numerical limit. All companies contacted preferred to assess each waste stream on a case-by-case basis.

3.0 PCB DISPOSAL TECHNOLOGIES

Nonradioactive PCBs and PCB items are traditionally disposed of in off-site or mobile permitted commercial facilities. In addition to the companies/facilities currently permitted to dispose of nonradioactive PCBs, many other technologies are under development through either the US EPA's Superfund Innovative Technology Evaluation (SITE) Program[5], and some of these innovative technologies have US EPA Region 5 Research and Development (R&D) Permits. However, these technologies have not been used, and would require additional testing and treatability studies to determine their applicability to radioactive PCB wastes that are generated at the FEMP.

The development of a mobile or skid mounted PCB destruction facility may provide a viable method for disposal of radioactively contaminated PCB soils, solids, and construction debris. Currently, a large volume of this type of waste does not exist and the use of an on-site PCB disposal system is not deemed immediately necessary. If large quantities of PCB waste are generated during demolition activities for OU3, procedures will be developed to handle that waste at that time, which may include on-site mobile disposal facility. The applicability of a particular on-site mobile disposal facility must be assessed against the particular characteristics of the waste stream (e.g., waste form, PCB concentration, radionuclide type and form, solvents, etc.).

The following sections overview permitted commercial nonradioactive PCB disposal facilities, innovative technologies under development, other technologies applicable to volume reduction or waste handling, and the applicability of the technology to radioactive PCBs.

3.1 PERMITTED COMMERCIAL PCB DISPOSAL FACILITIES

As discussed in Section 2.1 and as detailed in Table 2-1, TSCA currently defines the following PCB disposal methods for non-radioactive PCBs:

- Incinerators
- High-Efficiency Boilers
- Chemical Waste Landfills

---

[5]USEPA 1987, USEPA 1988, USEPA 1991a, USEPA 1991b.

- 15 pCi/g, averaged over 15-cm thick layers of soil more than 15 cm below the surface.

However, no DOE or NRC regulations or DOE Orders specify numeric soil release levels for uranium.

DOE Order 5820.2A establishes polices, guidelines, and minimum requirements for the management of radioactive wastes and mixed wastes. The Order notes that wastes containing radionuclides in concentrations below regulatory concern may be disposed of in a manner consistent with solid wastes regulations. However, because no standard has been established for radionuclide concentrations below regulatory concern, the waste must be nonradioactive or have "nondetectable" concentrations of radionuclides before the waste can be disposed of as a solid waste. Any PCBs that are nonradioactive or nondetectable can then be transferred to a commercial PCB disposal facility.

Before the FEMP may ship non-radioactively contaminated PCBs or PCB items to a commercial disposal facility, the facility must demonstrate to DOE Headquarters that the PCB or PCB item which was removed from a radiation area is nonradioactively contaminated. Such demonstration must be made to DOE Headquarters and "describe the criteria that was used, the basis for the criteria, and the methods used for measuring a waste for comparison to the criteria."

The US EPA and DOE 1986 FFCA requires that the DOE maintain an environmental monitoring program that measures the discharge of liquid radioactive materials and wastes. Compliance with this requirement will be necessary if any radioactively contamination is discharged during disposal.

Table 2-2. Figure IV-1 Surface Contamination Guidelines.

Radionuclides (See Note 1)	Allowable Total Residual Surface Contamination (dpm/100 cm^2) Removable (See Note 2)	Total (Fixed and Removable) (See Note 3)
Transuranics, I-125, I-129, Ra-226, Ac-227, Ra-228, Th-228, Th-230, Pa-231	20	500
Th-Natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	200	1,000
U-Natural, U-235, U-238, and associated decay product, alpha emitters	1,000 alpha	5,000 alpha
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	1,000 beta-gamma	5,000 beta-gamma

1. The values in this Table apply to radioactive conta;mination deposited on, but on incorporated into the interior of the contaminated item. Where contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for the alpha-and beta-gamma-emitting nuclides apply independently.

2. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. For objects with a surface area less than 100 cm^2, the entire suface should be swiped, and the activity per unit area should be based on the actual surface area. Except for transuranics, Ra-228, Ac-227, Th-228, Th-230, Pa-231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination.

3. The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm^2 is less than three times the values in Table 2-2.

Prior to land disposal, any of the "California list wastes" would need to comply with the treatment standards specified in 40 C.F.R. § 268.42. For other PCB wastes that are also hazardous wastes, prior to land disposal, these wastes would need to comply with both the LDR standards specified in 40 C.F.R. Part 268 for the particular waste type and the TSCA disposal requirements.

2.3 REGULATORY ASPECTS OF RADIOACTIVELY CONTAMINATED PCB WASTE STREAMS

The issue of disposal or destruction of radioactively contaminated PCB containing waste streams is complicated due to the lack of specific regulatory and DOE guidelines concerning disposal of radioactively contaminated media. It is standard practice at the FEMP to assume that any waste stream originating within the process area is radioactive until proven otherwise. PCBs generated in the process area are surveyed and analyzed for radiological contamination and decontaminated to remove the radioactive contamination when possible. Applicable regulations that establish levels of allowable radionuclide content for soils, equipment, and waste are found in DOE Order 5400.5 "Radiation Protection of the Public and the Environment," DOE Order 5820.2A "Radioactive Waste Management," the NRC restrictions for "Decontamination for Release for Unrestricted Use," (NRC 1982 and Regulatory Guide 1.86 as applied to non-reactor facilities), and 40 C.F.R. Part 192.

DOE Order 5400.5 provides guidance on the release of residual, reusable radioactive materials and on the release of radioactively contaminated real property. Before radioactive materials can be released, the materials must be surveyed to determine whether removable and total surface contamination meet the enumerated levels in Table 2-2. These limits apply to both internal and external surfaces of equipment and building components that are potentially salvageable or recoverable scrap. The surface contamination guidelines, shown in Table 2-2, are generally consistent with NRC standards found in NRC Regulatory Guide 1.86. In addition, DOE Order 5400.5 specifies generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230 and Th-232 in soils, which are:

- 5 picocuries per gram (pCi/g), averaged over the first 15 centimeters (cm) of soil below the surface ppm PCB concentration would need to comply with the RCRA LDR standards for F-listed wastes and the TSCA requirements for PCBs. Based on FEMP records, several drums of PCB waste may contain RCRA F-listed waste codes. Since F-listed waste codes have specific LDR requirements, these wastes may require treatment prior to disposal.

The RCRA LDR regulations specifically regulate certain classes of PCB liquids that are also hazardous waste. These wastes are termed "California list wastes" and are subject to the following LDRs:

- Liquid[3] hazardous wastes containing PCBs at concentrations greater than or equal to 50 ppm but less than 500 ppm must be incinerated in a TSCA incinerator or high efficiency boiler [40 C.F.R. § 268.42(a)(1)].

- Liquid hazardous wastes containing PCBs at concentrations greater than 500 ppm must be incinerated in a TSCA incinerator [40 C.F.R. § 268.42(a)(1)].

- Liquid hazardous wastes containing halogenated organic compounds[4] (HOCs) in total concentrations greater than or equal to 1,000 milligrams per liter (mg/l) must be incinerated in a RCRA incinerator [40 C.F.R. § § 268.32(e)(1) and 268.42(a)(2)].

- Liquid hazardous wastes that are primarily water and contain HOCs in total concentrations greater than or equal to 1,000 mg/l and less than 10,000 mg/l must be treated to < 1000 ppm [RCRA § 3004(d)(2) and 40 C.F.R. § 268.32(a)(3)].

- Non-liquid hazardous wastes containing HOCs in total concentrations greater than or equal to 1,000 milligrams per kilogram (mg/kg) must be incinerated in a RCRA incinerator [40 C.F.R. § 268.42(a)(2)].

---

[3]EPA Method 9095 (Paint Filter Liquids Test) is used to determine whether a waste is a liquid.

[4]The list of regulated HOCs, as specified in 40 C.F.R. Part 268, Appendix 111, includes seven specific Aroclors (i.e., Aroclor 1016, 1221, 1232, 1242, 1248, 1254, and 1260) as well as "PCBs not otherwise specified."

EPA (refer to Section 3.1 for permitted commercial PCB disposal companies). Further, according to 40 C.F.R. § 761.60, "any person...required to incinerate PCBs and PCB Items...and who can demonstrate that an alternative method of destroying PCBs and PCB Items exists [which] can achieve a level of performance equivalent to 761.70 incinerators or high-efficiency boilers may submit a written request to...the Regional Administrator." US EPA guidance for Superfund sites indicates that an equivalent level of performance for an alternate disposal method for PCBs is demonstrated if the method reduces the level of PCBs to less than 2 ppm as measured in the treated residual, and that the treated residual can then be disposed of on site without further regulation (US EPA 1986).

Generators who offer PCBs for shipment to TSCA-permitted facilities are required to comply with specified regulations. Transportation of PCB wastes off site will required that the DOE comply with the marking requirements for PCB wastes specified in 40 C.F.R. Part 761, Subpart C, and the shipping manifest requirements specified in 40 C.F.R. Part 761, Subpart K.

2.2 WASTE TREATMENT/DISPOSAL UNDER RCRA LAND DISPOSAL REGULATIONS

PCBs generated during remediation activities that are also determined to be hazardous waste may be subject to RCRA LDRs. PCBs may be classified as hazardous waste if the PCB exhibits a hazardous waste characteristic (i.e., ignitability, corrosivity, reactivity, or toxicity), or if the PCB is mixed with a listed hazardous waste. For example, an oily waste stream contaminated with PCBs (at a concentration equal to or greater than 50 ppm as determined under TSCA) which exhibits the characteristic of ignitability according to 40 C.F.R. § 262.21(a)(1) would be classified as a "hazardous waste containing PCBs," and would be subject to the LDR(s) for that characteristic. Disposal of PCB-containing dielectric fluid, and electric equipment containing such fluid, which are hazardous only because they fail the toxicity characteristic (D018 through D043), however, are exempt from RCRA regulations (40 CFR § 261.8). These materials are regulated only under TSCA and its implementing regulations, 40 C.F.R. Part 761 (40 C.F.R.).

In addition, non-liquid wastes that contain PCBs in concentrations equal to or greater than 50 ppm and are hazardous must comply with both TSCA and RCRA requirements. For example, rags that are contaminated with F-listed solvents and contain more than 50

Table 2-1. Disposal Options for PCBs under TSCA.[1/]

PCB Concentration/Waste Category	Disposal Options: Incinerator (40 CFR 761.70)	Chemical Waste Landfill (40 CFR 761.60)	High Efficiency Boiler (40 CFR 761.60(e))	Alternative Method (40 CFR 761.60(e))	Drain, Dispose of as a Solid Waste (40 CFR 761.60(b)(c))	Examples of Waste Categories (Refer to Table 5-1 for a listing of the PCB waste currently stored at the Fernald site)
PCB hydraulic machines	NA	NA	NA	NA	YES[3/]	The study to identify the PCB hydraulic machines at the FEMP site is currently underway
PCB contaminated electrical equipment (except capacitors)	NA	NA	NA	NA	YES[4/]	Circuit breakers, reclosers, voltage regulators, switches, cable, electromagnets
Other PCB articles	YES	YES	NA	NA	YES[4/]	Pipes, pumps, leaking fluorescent lighting ballasts
PCB containers	NA	NA	NA	NA	YES[5/]	Drums, tanks, bags, cans

1/ Source: Adapted from EPA 1990a.
2/ NA = not applicable
3/ The equipment must be drained and the drained liquid disposed of accordance with 40 CFR 761.60(a). Further, if the hydraulic fluid drained from the equipment contains greater than 1,000 ppm PCB the equipment must be flushed and the flushing solvent disposed of in accordance with 40 CFR 761.60(a).
4/ Contaminated electrical equipment and other PCB articles must be drained of all-free flowing liquid. The disposal of the drained electrical equipment and other PCB articles is not regulated by 40 CFR 761. All drained liquids must be disposed of in accordance with 40 CFR 761.60(a).
5/ The PCB containers must be decontaminated per 40 CFR 761.79.

000028

Table 2-1. Disposal Options for PCBs under TSCA.[1]

PCB Concentration/Waste Category	Disposal Options: Incinerator (40 CFR 761.70)	Chemical Waste Landfill (40 CFR 761.60)	High Efficiency Boiler (40 CFR 761.60(e))	Alternative Method (40 CFR 761.60(e))	Drain, Dispose of as a Solid Waste (40 CFR 761.60(b)(c))	Examples of Waste Categories (Refer to Table 5-1 for a listing of the PCB waste currently stored at the Fernald site)
PCB concentration: 50-500 ppm						
PCB liquids with flashpoint greater than 60 degrees C	YES	YES	YES	YES	NA[2]	Aqueous waste streams such as liquid-filled drums and aqueous-based decontamination solutions
PCB liquids with flashpoint less than 60 degrees C	YES	NO	YES	YES	NA	Oily liquids such as drained hydraulic fluids
PCB liquids that are also hazardous	YES	NO	YES	YES	NA	Liquids also containing hazardous constituents
PCB nonliquids (soil, rags, debris)	YES	YES	NO	YES	NA	Soil, rags, filters, personal protective clothing, construction debris
PCB transformer (drained and flushed)	YES	YES	NO	NO	NA	All known FEMP transformers have already been removed and disposed of
PCB large capacitors	YES	YES	NO	NO	NA	The study to identify the PCB capacitors at the FEMP site is currently underway

Existing spills (spills which occurred prior to May 4, 1987), are excluded from the scope of 40 C.F.R. § 761.120 for the following two reasons:

- The policy is not intended to require additional cleanup of old spills that have already been cleaned in accordance with the requirements imposed by an EPA regional office

- Old spills that are discovered after May 4, 1987 will require a site-by-site evaluation because of the likelihood that the site involves more pervasive PCB contamination. According to conversations with the TSCA Hotline, a spill that is older than a few days constitutes an "old spill." Old spills are subject to cleanup requirements established at the discretion of US EPA, usually through the US EPA's regional office.

The possible PCB disposal methods defined/regulated/permitted under TSCA include the following:

- Incinerators (40 C.F.R. § 761.70)

- High-Efficiency Boilers (40 C.F.R. § 761.60)

- Chemical Waste Landfills (40 C.F.R. § 761.70)

- Alternative Disposal Methods (40 C.F.R. § 761.60(e)).

Table 2-1 overviews the TSCA disposal and storage requirements by PCB category and PCB concentration for the solid and liquid PCBs expected to be generated during the activities of removing, decontaminating as appropriate, and disposing of PCBs and PCB Items prior to demolition of the structures and buildings within OU3. (There are additional requirements under the FERMCO PCB Policy which is attached to this report as Appendix B). RCRA LDRs may also apply to a PCB contaminated waste if the waste is determined to also be a hazardous waste (refer to Section 2.2). In addition, none of the options listed in Table 2-1, with the exception of the DOE Oak Ridge Incinerator for PCB liquids, are applicable to mixed waste PCBs.

Commercial PCB disposal companies (i.e., incinerators, high-efficiency boilers, and companies using alternative disposal methods) are approved and permitted by the US

Under the FERMCO PCB policy, solid state equipment such as microwave ovens, electronic equipment, and computers will be presumed and managed as non-PCB contaminated.

Leaking PCB fluorescent light ballasts are subject to TSCA storage and disposal requirements. Under US EPA policy, and CERCLA requirements larger volumes of fluorescent light ballasts disposed of at one time are subject to TSCA's disposal requirements. This policy is based upon the meaning of fluorescent light ballasts that are defined in part as "a capacitor containing 0.1 kg or less of dielectric" [i.e., a small capacitor] (40 C.F.R. § 761.3). Therefore, fluorescent light ballasts are subject to the same disposal requirements as PCB small capacitors. Once a PCB small capacitor starts leaking, it is regulated as a PCB Article and must be disposed of according to 40 CFR § 761.60 (a).

- PCB Spills. PCB Spills are defined as "both intentional and unintentional spills, leaks, and other uncontrolled discharges where the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases. This policy applies to spills of 50 ppm or greater PCBs. Where a spill of untested mineral oil occurs, the oil is presumed to contain greater than 50 ppm, but less than 500 ppm PCBs, and is subject to the relevant requirements of this policy" (40 C.F.R. § 761.123). Under 40 C.F.R. § 761.60(d), spills of PCBs at concentrations of 50 ppm or greater constitutes disposal of PCBs.

The determination of the PCB concentration in wastes resulting from the cleanup and removal of spills is made based on the PCB concentration in the source material, and is not based on the actual PCB concentration in the waste as determined by laboratory analysis. For example, PCBs (i.e., personal protective equipment, spent decontamination fluids, adsorbent pads loaded with oil/grease/PCBs/rust, etc.) resulting from the cleanup of a spill with a source material concentration of 100 ppm are classified as having a PCB concentration of 100 ppm. The approach to determining the PCB concentration in PCBs is contained in 40 CFR 761.1(b) wherein it states: that "no provision specifying a PCB concentration may be avoided as a result of any dilution unless otherwise specifically provided."

regulated by TSCA. Large capacitors containing between 50 and 500 ppm must be disposed of according to 40 C.F.R. § 761.60(4).

- PCB Containers. PCB Containers are defined as "any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB Articles and whose surface(s) has been in direct contact with PCBs" (40 C.F.R. § 761.3). PCB containers with PCB concentrations of 500 ppm or greater are subject to TSCA disposal requirements. PCB containers that contained PCBs at concentrations less than 500 ppm are not subject to TSCA disposal requirements if the PCBs that are in a liquid state have been drained (40 C.F.R. § 761.60(c)).

- PCB Article Containers. PCB Article Containers are defined as "any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB Articles or PCB Equipment, and whose surface(s) has not been in direct contact with PCBs" (40 C.F.R. § 761.3).

- PCB Item. A PCB Item is defined as "any PCB Article, PCB Article Container, PCB Container, or PCB Equipment, that deliberately or unintentionally contains or has as part of it, any PCB of PCBs" (40 C.F.R. § 761.3).

- PCB Equipment. PCB Equipment is defined as "any manufactured item, other than a PCB Container or a PCB Article Container, which contains a PCB Article or other PCB Equipment..." (40 C.F.R. § 761.3).

  Examples of PCB Equipment include:

  - microwave ovens

  - electronic equipment

  - fluorescent light ballasts.

000024

- PCB capacitors[2]

- electrical motors and pumps

- PCB hydraulic machines.

Small capacitors are generally exempt from TSCA disposal requirements unless the person who owns the capacitor manufactured it or at any time manufactured PCB capacitors or PCB equipment (40 C.F.R. § 761.60(b)(2)(ii) and (iv)), or unless the small capacitor is leaking. Leaking small capacitors must be disposed of in accordance with 40 CFR § 761.60 (a). Even though the disposal of small capacitors may be exempt under TSCA regulations (unless leaking), CERCLA requires the proper disposal when a number of small capacitors have been accumulated.

FERMCO has adopted as a Best Management Practice a policy that all non-radioactively contaminated fluorescent light ballasts (PCB and non-PCB) will be disposed of by an approved recycling vendor.

- PCB-Contaminated Electrical Equipment. PCB-Contaminated Electrical Equipment is defined as "any electrical equipment, including but not limited to transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable, that contain 50 ppm or greater PCB, but less than 500 ppm PCB. Oil-filled electrical equipment other than circuit breakers, reclosers, and cable whose PCB concentration is unknown must be assumed to be PCB-Contaminated Electrical Equipment" (40 C.F.R. § 761.3). The equipment must be drained of all free flowing liquid and disposed of as a PCB. Disposal of the drained electrical equipment is not

---

[2] A "small capacitor" is defined as containing less than 3 pounds of dielectric PCB fluid. A "large low-voltage" capacitor contains 3 or more pounds of dielectric PCB fluid and operates below 2,000 volts (a.c. or d.c.), and a "large high-voltage" capacitor contains 3 or more pounds of dielectric PCB fluid and operates at or above 2,000 volts (a.c. or d.c.). If the actual weight of the dielectric fluid is unknown, a capacitor whose total volume is less than 100 cubic inches may be classified a small capacitor, and a capacitor whose total volume is more than 200 cubic inches must be classified as a large capacitor. A capacitor whose total volume is between 100 and 200 cubic inches may be classified as a small capacitor if the total weight of the capacitor is less than 9 pounds.

- PCBs. PCBs at concentrations equal to or greater than 50 parts per million (ppm). PCB and PCBs are defined as "any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substances" (40 C.F.R. § 761.3).

  PCBs regulated for disposal include:

  - mineral oil dielectric fluid from PCB-contaminated electrical equipment containing a concentration of 50 ppm or greater, but less then 500 ppm

  - liquids, other than mineral oil dielectric fluid, containing a PCB concentration of 50 ppm or greater, but less than 500 ppm

  - non-liquid PCBs at concentrations of 50 ppm or greater in the form of soil, rags, or other debris.

- PCB Articles. PCB Articles are defined as "any manufactured article, other than a PCB Container, that contains PCBs and whose surfaces(s) has been in direct contact with PCBs" (40 C.F.R. § 761.3). PCB articles with a concentration of 500 ppm or greater must be disposed of according to the TSCA regulations. If the PCB article contains PCB concentrations between 50 and 500 ppm, then it must be drained. Disposal of the liquid is regulated by TSCA, but the drained article is not subject to TSCA disposal requirements.

  Specific PCB Articles include:

  - transformers[1]

[1] "PCB Transformers" contain PCBs in concentrations of 500 ppm or greater. Transformers that contain between 50 and 500 ppm PCBs are defined as "PCB-Contaminated Equipment," and transformers that contain less than 50 ppm PCBs are defined as "Non-PCB Transformers."

Currently, no regulatory framework exists that effectively deals with the storage, treatment (when applicable), and disposal of radiologically contaminated PCBs. For example, the TSCA regulations require that "any PCB Article or PCB Container...shall be removed from storage and disposed of...*within one year from the date it was first placed in storage*" (emphasis added) (40 C.F.R. § 761.65(a)). Generally, PCBs and PCB Items are transported to a disposal facility within 9 months from the date the PCB or PCB item was removed from service, which allows the disposal facility 3 months to dispose of the material. However, because the liquid PCBs generated at the FEMP may contain radionuclides, disposal options are limited to the DOE TSCA Incinerator. The TSCA Incinerator is unable to accept solid radiologically contaminated PCB waste at this time and there are no other disposal options currently available. As a result, the FEMP has been forced to exceed the allowable storage times until another suitable disposal option is identified. US EPA Region 5 is kept apprised of the PCB storage dilemma at the FEMP site through the 1-year PCB exception reports, and the biannual reporting requirement pursuant to the Notice of Noncompliance (NON) issued in November, 1991.

Another complicating factor may be the presence of radiologically contaminated PCB wastes that are also RCRA hazardous wastes. These wastes need to comply with both the disposal requirements under TSCA and the land disposal restrictions (LDRs) under RCRA. The RCRA LDR regulations enumerate specific treatment and disposal requirements for liquid RCRA hazardous wastes containing PCBs (California List Wastes) at specified concentrations. These wastes are prohibited from land disposal unless the wastes comply with both the LDRs specified in the RCRA LDRs (40 C.F.R. § 268.42) and the disposal standards specified in the TSCA regulations (40 C.F.R. § 761.60). Since disposal options for radiologically contaminated RCRA/TSCA wastes are limited, the 1-year TSCA and RCRA storage requirements and land disposal restrictions are difficult to meet.

2.1 WASTE DISPOSAL UNDER TSCA

The storage and disposal requirements are detailed in 40 C.F.R. Part 761, Subpart D (40 C.F.R. § 761.60) and are based on the type and concentration of PCBs to be disposed of. General PCB categories listed in Subpart D which may pertain the PCBs or PCB items encountered at the FEMP are as follows:

2.0 REGULATORY PERSPECTIVE

The EPA has specified a framework for developing and implementing response actions (including removal actions) at NPL sites under the National Oil and Hazardous Substances Pollution Control Plan (NCP, 40 Code of Federal Regulations [C.F.R.] Part 300, Subpart E [1990]). The NCP requires that all applicable or relevant and appropriate requirements (ARARs) be identified for remedial actions and releases of hazardous substances (40 C.F.R. § 300.400(g)). Removal actions under CERCLA must to the extent practicable under the circumstances attain all ARARs under federal and state environmental laws. For removal actions, the urgency of the situation and the scope of the removal action dictate the extent to which ARARs must be complied with. ARARs will need to be attained for any work performed under Removal Action No. 9. The potential ARARs for Removal Action No. 9 include the Toxic Substances Control Act (TSCA, 15 U.S.C. § 2601 *et seq.*), Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 *et. seq.*), Clean Water Act, Federal Facilities Compliance Act, DOE Orders, Nuclear Regulatory Commission (NRC) Regulations and guidance, and other environmental laws, regulations, and agency guidance. For purposes of PCB disposal options, this report will analyze the storage and disposal requirements under TSCA, RCRA and DOE Orders.

TSCA forms the legal framework intended to support "the manufacture, processing, distribution in commerce or use (or any combination of such activities) of any polychlorinated biphenyls...". The US EPA's regulations governing "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" are specified in 40 C.F.R. Part 761. The PCB spill cleanup policy is specified in 40 C.F.R § § 761.120 through 761.135 (Subpart G), and PCB storage and disposal requirements are enumerated in 40 C.F.R § 761.60 (Subpart D).

The activities of removing, decontaminating, and disposing of PCBs and PCB Items prior to demolition of the structures and buildings within OU3 will generate liquid and solid waste streams. Because the disposal will need to comply with all ARARs and regulatory overlap may occur, each waste stream should be carefully evaluated using the criteria specified in TSCA, RCRA, radioactive waste disposal regulations, and DOE Orders.

- To review surface decontamination techniques that may be used during or prior to OU3 demolition activities as a means of minimizing the generation of PCBs and PCB contaminated mixed wastes

- To evaluate the future disposal options for PCBs that may be generated at the FEMP.

5 7 5 ? 3

- PCBs and PCB Items may be contaminated with radionuclides. Disposal options for radioactive PCBs are very limited.

- Fluids in capacitors, transformers, and other electrical systems and equipment may contain PCBs. These items, for the most part, have been identified and removed from service at the FEMP.

- Fluids in auxiliary process equipment may contain PCBs. For equipment for which no manufacturer information is available, the fluids may have to be sampled and analyzed for PCBs, which is necessary to characterize potential PCBs.

- Suspect solid surfaces and soils may be contaminated with PCBs. The sampling plan for these media has been developed in conjunction with the OU3 RI/FS.

- There are PCBs and PCB items currently in storage. 48 drums of PCBs and PCB items are currently stored at the FEMP. It is anticipated that the concentrations of PCBs and radionuclides in several drums may need to be reanalyzed.

- Future removal actions and remediation activities may generate additional liquids and solids contaminated with PCBs and radiological contamination. and it may also prove to be impossible to decontaminate these PCBs and PCB items for such radiological contamination.

The primary issue in the management of PCBs and PCB items at the FEMP is the disposition of PCB contaminated solid wastes that are also contaminated with radionuclides. The purpose of this report is not to provide a definite course of action in regard to disposal technologies but rather to present the results of a study conducted to satisfy the following objectives:

- To identify and evaluate existing commercial PCB disposal facilities relative to their ability to dispose of current and future FEMP PCBs and PCB Items

- To identify and evaluate innovative technologies that may be used to treat and dispose of PCB contaminated mixed wastes

1.0 INTRODUCTION AND OBJECTIVES

The Fernald Environmental Management Project (FEMP), located near Fernald Ohio, was designated a Superfund site and placed on the National Priorities List (NPL) in November 1989. The site is being remediated pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] § 9600 *et. seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986 [SARA]), and the July 18, 1986 U.S. Environmental Protection Agency (US EPA) and U.S. Department of Energy (DOE) Federal Facility Compliance Agreement (FFCA), as amended by the April 1990 Consent Agreement and subsequent amendments. A key element of the FFCA and subsequent Consent Agreements includes grouping the site into five operable units (OUs) to facilitate characterization and remediation. Section X.C. of the Amended Consent Agreement defines Operable Unit 3 (OU3) as the production area that consists of the production area and production-associated facilities and equipment, including but not limited to structures, equipment, drum treatment facilities, scrap metal and debris piles, and tanks. OU3 is currently in the remedial investigation/feasibility study (RI/FS) stage.

Section IX of the Amended Consent Agreement requires that DOE develop and perform specified removal actions. Several of these removal actions have been initiated within the boundaries of OU3. Section IX.F of the Amended Consent Agreement requires the development and submittal of a work plan for Removal Action No. 9, "Removal of Waste Inventories." A Removal Action Work Plan Information Document is being submitted as part of Removal Action No. 9 that requires that the following activities be performed:

- An evaluation of currently stored polychlorinated biphenyls (PCBs)
- An investigation of suspect PCBs and PCB Items
- A comprehensive inventory and removal plan for PCBs and PCB Items

There are six primary issues with respect to the management of PCBs and PCB Items at the FEMP:

Nuclear Regulatory Commission (NRC) license. A recent memorandum allows the use of commercial facilities for the disposal of small quantities of mixed waste on a case-by-case basis.

The management of radioactively contaminated PCB liquid and solid materials currently stored at the FEMP, or which will be generated in the future, should consider the following:

- PCB contaminated liquids can continue to be sent to the DOE TSCA Oak Ridge Incinerator, consistent with the existing DOE agreement. An aggressive schedule for the sampling and shipping of FEMP PCB liquids will need to be established between the FEMP and Oak Ridge.

- Continued on-site storage of radioactively contaminated PCB solids at the FEMP will be necessary, as no off-site commercial disposal facility was found to be properly equipped or licensed to accept radioactively contaminated PCBs or PCB items.

A review of existing disposal technologies was conducted to identify any that may be applicable for on-site implementation. The review indicated that while several technologies currently exist for the decontamination of aqueous waste streams, PCB contaminated surfaces, and PCB contaminated solids, they do not specifically address the radiological component. Selection of on-site disposal technologies will require careful characterization of the PCB waste streams, and may require treatability studies prior to implementation.

EXECUTIVE SUMMARY

An evaluation of the available storage and disposal options for radioactively contaminated polychlorinated biphenyl (PCB) waste streams was performed as part of the Fernald Environmental Management Project (FEMP) Removal Action No. 9, Removal of Waste Inventories. This document details the applicable site conditions, regulatory constraints, disposal technologies, and disposal facilities available for the disposition of FEMP radiologically contaminated PCBs and PCB items. This document is not for the purpose of discussing disposal alternatives for non-radioactively contaminated PCBs and PCB items which may be disposed of by commercial facilities.

The results of this evaluation indicated the following:

- The only PCB disposal facility licensed to treat radioactively contaminated PCB liquids is the U.S. Department of Energy (DOE) Toxic Substances Control Act (TSCA) Oak Ridge Incinerator. The FEMP has shipped liquid PCB materials for destruction to the DOE TSCA Oak Ridge Incinerator in the past, and this continues to be the only viable alternative for disposition of radioactively contaminated liquid PCBs. The Oak Ridge facility does not have the ability, nor is it approved to dispose of, radioactively contaminated solid PCBs.

- While radioactively contaminated PCB solids currently stored on site are in violation of the 1-year disposal regulation, these PCBs cannot be shipped to off-site commercial facilities because none of these facilities are licensed to dispose of PCB/radioactive waste streams.

- DOE Order 5400.5 and Reg. Guide 186 provide guidance for the release of radioactively contaminated wastes but applies only to surface contamination and not volume (in-depth) release criteria. Before a material may be released on surface contamination levels alone, it must be proven that radioactivity was not added (in volume or in depth).

- Prior DOE policy memoranda prohibited the release of any radioactively suspect TSCA or Resource Conservation and Recovery Act (RCRA) material from a DOE site to any commercial disposal site that does not have an active

ACRONYMS (continued)

RI	Remedial Investigation
SITE	Superfund Innovative Technology Evaluation
SOP	Standard Operating Procedure
TCE	trichloroethylene
TSCA	Toxic Substances Control Act
ug	microgram
U.S.C.	United States Code
US EPA	U.S. Environmental Protection Agency

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
BTU	British thermal unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
cm	centimeter
DOD	Department of Defense
DOE	U.S. Department of Energy
DVRF	Decontamination and Volume Reduction Facility
DWS	Debris Washing System
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facilities Compliance Agreement
FS	Feasibility Study
ft^2	square feet
g/cm^2	grams per square centimeter
HOC	halogenated organic compound
kHz	kilohertz
LDR	land disposal restriction
m^3	cubic meter
mg/l	milligrams per liter
NCP	National Oil and Hazardous Substances Pollution Control Plan
NDA	nondestructive assay
NON	Notice of Noncompliance
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OU	operable unit
OU3	Operable Unit 3
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
ppm	parts per million
PVC	polyvinyl chloride
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act

TABLES

000012

CONTENTS (continued)

CONTENTS

5772

REMOVAL ACTION NO. 9; MANAGEMENT OF PCBs AND PCB ITEMS PCB DISPOSAL OPTIONS REPORT

JANUARY 1994

REMOVAL ACTION NO. 9; MANAGEMENT OF PCBs AND PCB ITEMS PCB DISPOSAL OPTIONS REPORT

JANUARY 1994

PREPARED FOR: Fernald Environmental Restoration Management Corporation

PREPARED BY: Ebasco Environmental
Fairfield Executive Center
6120 S. Gilmore Road, Suite 155
Fairfield, Ohio 45014-5157

Enclosure 2

Inventory No.	Description of Drum Contents	Classification	Sampling Data Available
725	Absorbent Pads	SR	
726	Damp Coveralls	SR	PCB and RAD Data Available
727	Oily Plastic	LR	PCB and RAD Data Available
731	Oily Plastic, Sheets, Bags	LR	PCB and RAD Data Available
732	Oily Sludge	LR	
733	Rags	LR	
734	Sample Jars, Residues	LR	
735	Oily Plastic	LR	
736	Plastic Oil	LR	
737	Plastic Oil	LR	
738	Plastic Oil	LR	PCB and RAD Data Available
1861	2 Leaking Ballasts	SR	RAD Data Available
3704	Graphite Coating, Floor Dry	SR	RAD Data Available
4644	5 Leaking Capacitors	SR	RAD Data Available
4651	2 Capacitors	LR	RAD Data Available
6321	Lab Pack – 17 Quart Jars	LR	RAD Data Available
6504	Trash, Gloves, Plastic Bags	SR	RAD Data Available
7765	Empty PCB Container	SR	
13944	Ballasts	NC	Shipped to Rollins
13998	Leaking Ballasts	SR	RAD Data Available
14401	Contents from Drum 435 Sample Residues	RM	PCB and RAD Data Available Indicate Non–PCB
14690	Leaking Ballasts and Capacitors	NC	Shipped to Rollins
14694	Ballasts, Capacitor, Electrical Parts	NC	Shipped to Rollins
14849	Trash, PPE	NC	Shipped to Rollins

LR – Liquid RAD Contaminated = 20
SR – Solid RAD Contaminated = 19
RM – Remove from Inventory = 6
NC – Not Contaminated and Shipped to Rollins for Disposal = 4

Total Drums Included in this Report = 49

900006

ATTACHMENT 1: PCBs AND PCB ITEMS COVERED FOR SEMI-ANNUAL PERIOD JANUARY, 1994 THROUGH JUNE, 1994

Inventory No.	Description of Drum Contents	Classification	Sampling Data Available
361	Water	LR	PCB and RAD Data Available
434	2 Electrical Switches Contaminated Pads 5 Leaking Ballasts	SR	RAD Data Available
436	2 Leaking Ballasts	SR	RAD Data Available
658	5 Leaking Ballasts	SR	RAD Data Available
688	Floor Dry, Dicalite	SR	RAD Data Available
689	Oily Plastic	LR	PCB and RAD Data Available
696	Oily Sludge	LR	PCB and RAD Data Available
697	Oily Plastic	LR	PCB and RAD Data Available
701	Oily Rags	LR	PCB and RAD Data Available
702	Rags, Trash	SR	PCB and RAD Data Available
703	Anti-Cs, Gloves	SR	PCB and RAD Data Available
704	Oil, 3/4 Full	RM	PCB and RAD Data Available Indicate Non-PCB
705	Oil, 3/4 Full	RM	PCB and RAD Data Available Indicate Non-PCB
706	Oil, 3/4 Full	RM	PCB and RAD Data Available Indicate Non-PCB
707	Oily Plastic	LR	PCB and RAD Data Available
708	Oil	RM	PCB and RAD Data Available Indicate Non-PCB
713	Floor Sweepings, Floor Dry	SR	RAD Data Available
714	Absorbent Pads, Dry Rags, Trash	SR	PCB and RAD Data Available
715	Dry Rags, Trash	SR	PCB and RAD Data Available
716	Oily Plastic Bags	LR	PCB and RAD Data Available
717	Absorbent Pads	SR	PCB and RAD Data Available
720	Absorbent Pads	SR	PCB and RAD Data Available
721	Oily Plastic	LR	PCB and RAD Data Available
723	Oily Rags	LR	PCB and RAD Data Available
724	Oily Plastic, Rags	RM	PCB and RAD Data Available Indicate Non-PCB

cc w/o enc:

J. Sanz, EPA-V
K. A. Chaney, EM-423, QO
K. L. Alkema, FERMCO/65-2
S. L. Hinnefeld, FERMCO/31
J. E. King, FERMCO/52-3
J. W. Reising, DOE-FN

19 drums of radioactive contaminated PCB solids include trash, debris, and electrical equipment that cannot be decontaminated. All radioactively mixed PCBs and PCB items are stored in Building 81. These wastes have no current disposal options and will remain in storage until a viable disposal option is available.

Non-Radioactively Contaminated PCB Solids/Commercial Disposal Facility

The FEMP was able to disposition four drums of non-radiologically contaminated PCB items including leaking PCB fluorescent light ballasts and PCB large low voltage capacitors by transporting them to a commercial disposal facility in Deer Park, Texas (Rollins Environmental Services) in February, 1994. The manifest and burn certificates will be included with the PCB Annual Document Log prepared for the Calendar year 1994. At this time, there are no non-radiologically contaminated PCB drums in storage at this time.

PCB Actions

As stated above, the radioactively contaminated PCB liquids are scheduled to be incinerated in the TSCA incinerator at the Oak Ridge facility through 1995. Meanwhile, all radioactively contaminated PCBs and PCB items are being stored and managed in a storage facility (Building 81) and will continue to remain in such storage until a viable disposal option has been determined.

As reported in the January 1994 Semi-Annual Report, an Addendum to Removal Site Evaluation - Management of PCBs and PCB Items was incorporated into the Administrative Record as the third action within Removal Action 9 (Removal of Waste Inventories) in November, 1993. The purpose of this action is to identify, remove and disposition PCBs and PCB items at the FEMP not currently inventoried, as well as to evaluate disposal options for those PCBs and PCB items currently in storage. The findings from the site survey of areas suspected of containing PCBs and PCB items, identification of applicable disposal technologies for PCB contaminated waste materials, and evaluation of off-site storage and disposal facilities are being coordinated with remedial activities resulting from the Operable Unit 3 (OU3) Interim Record of Decision (IROD).

If you have any questions concerning this subject, please contact Ed Skintik, 513 648-3151.

Sincerely,

Walter J. Quaider

Walter J. Quaider
Acting Associate Director
Safety, Operations & Technical Support

FN:Skintik

Enclosures

cc w/enc:

Administrative Record, FERMCO

PCB Inventory

The FEMP currently has 45 drums of PCBs and PCB items at the FEMP in its inventory. Pursuant to analytical information, the FEMP is in the process of removing 6 of the 45 drums, which will leave a remaining total of 39 PCB drums in storage. Sampling and analyses indicated that these 6 drums should be characterized as Resource Conservation and Recovery Act (RCRA) mixed waste and will be stored appropriately. Additionally, four drums of leaking PCB fluorescent light ballasts and PCB large low voltage capacitors were shipped to Rollins Environmental Services in Deer Park, Texas in February 1994 for incineration. All non-radiologically contaminated drums containing PCB items have been disposed. An identification of the inventory of PCB drums held for more than one year including the disposal status is provided below:

Non-PCB Drums to be Removed from Inventory	6 Drums
Radioactively Contaminated PCB Liquids for Incineration	20 Drums
Radioactively Contaminated PCB Solids - No Disposal Option	19 Drums
TOTAL	45 Drums

Enclosure 1 is a table to identify each of the above 45 drums currently in inventory along with inventory numbers, a description of the contents, its classification of liquid or solid, and what analytical information is available. Also included is the identification of the four drums transported to Rollins Environmental Services for incineration.

Radioactively Contaminated PCB Liquids

There are 20 drums of radioactively contaminated PCB liquids. These 20 drums are scheduled to be incinerated in the Toxic Substance Control Act (TSCA) Incinerator at the Oak Ridge Facility in Oak Ridge, Tennessee. They are currently being stored in a FEMP warehouse (Building 81) in compliance with the storage regulations set forth in 40 CFR 761. Disposal of the 20 drums is scheduled to be pursued in conjunction with Removal Action No. 9, Removal of Waste Inventories.

Discussions have been ongoing with personnel from Oak Ridge who operate the TSCA Incinerator, and these PCBs have been placed on the DOE burn schedule for disposal through 1995.

It should be noted that these 20 drums actually contain a mixture of liquids and solids and will be segregated when a definite shipping date has been determined. Because the TSCA Incinerator is unable to accept solid PCBs for disposal, the liquids will be pumped into a tanker vehicle and the solids will be consolidated into drums and returned to storage.

Radioactively Contaminated PCB Solids

A Disposal Options Report has been written to address disposal options available for the disposition of 19 drums of radioactively contaminated solid PCBs. A copy of that January 1994 Report (less appendices) is enclosed. The

Department of Energy
Fernald Environmental Management Project
P. O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 648-3155

JUN 14 1994

DOE-2081-94

Mr. Tony Silvasi
PCB Control Section (SP-14J)
U. S. Environmental Protection Agency
230 South Dearborn
Chicago, Illinois 60604

SEMI-ANNUAL PCB STATUS REPORT, JULY 1994

References: 1) US EPA-V, P. A. Reed to R. E. Tiller, "Notice of Noncompliance for Polychlorinated Biphenyls (PCB) Storage," dated February 26, 1992

2) FERMCO:C:OP:93-0752, N. C. Kaufman to R. J. Hansen, "Semi-Annual PCB Status Report," dated June 16, 1993

The purpose of this letter is to transmit the Semi-Annual Polychlorinated Biphenyl (PCB) Status Report to the United States Environmental Protection Agency (US EPA) Region V pertaining to PCB activities from the period of January, 1994 through June, 1994. In Reference 1, US EPA Region V requested the Department of Energy (DOE) to provide a Semi-Annual Status Report detailing the efforts undertaken to dispose of PCBs and PCB items at the Fernald Environmental Management Project (FEMP). This report will update the status of the PCBs and PCB items identified in Reference 2. This report is in addition to the PCB Annual Document Log required to be prepared and maintained by the FEMP by July 1, annually.

Background

A representative of the US EPA conducted an inspection of the FEMP site on August 20, 1991, to determine compliance with the Toxic Substances Control Act (TSCA) regulations set forth in 40 Code of Federal Regulations (CFR) 761 in regard to Polychlorinated Biphenyls (PCBs). On November 14, 1991, the US EPA issued to the FEMP a Notice of Noncompliance (NON) for storing a large number of PCB containing drums in excess of one year, which is a violation of 40 CFR 761.65(a). In response to the NON, the DOE described the limited disposal and treatment options for radioactively mixed PCBs. As a follow-up action, US EPA requested that DOE submit a Semi-Annual PCB Status Report for the three waste categories: (1) Radioactively Contaminated PCB Liquids; (2) Radioactively Contaminated PCB Solids; and (3) Non-Radioactively Contaminated PCB Solids for Commercial Disposal.

5772 G-000-103 .78

SEMI-ANNUAL PCB STATUS REPORT, JULY 1994

07/14/94

DOE-2081-94
DOE-FN USEPA
90
REPORT